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- Fish For Nutritional Security *(Intl. Symp : CIFE, Dec 2001)*
- Sub-surface Tuna Longlining by Small Mech. Boats
- State of World Fisheries

MARCH 2002

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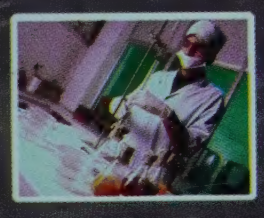

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FISHING CHIMES

A monthly journal devoted to the development of Fishery Industries

Upgrades Capabilities ; Augments Output

NATIONAL FISHERIES JOURNAL OF INDIA

Vol. 21 No. 12

MARCH 2002

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Singapore Seafood Exhibition & Seafood Processing Asia and Global Shrimp OP: 2001 & Global Shrimp Outlook: 2001

The speakers at these two shrimp events presented a graphic picture of the global trends (in the eastern and western hemispheres) in respect of shrimp culture and also its various components, besides the ongoing international shrimp business proclivities. An useful aspect is that Global Shrimp OP: 2001 yielded substantial data for the benefit of farmers of both the hemispheres to plan switching over to advanced systems of eco-friendly shrimp culture. Analysis was also presented on the varying extents of adoption of improved systems related to various culture phases, besides bringing out the status of development of domesticated shrimp broodstocks. A chockfull coverage running into sixteen pages.....**17**

AIFI Confers *LIFETIME ACHIEVEMENT* Awards

The Association of Indian Fishery Industries has taken a welcome initiative of honouring three of its vintage members with Lifetime Achievement Awards, at a splendid and a largely attended function held in Visakhapatnam on 21st December 2001. A Report **23**

MPEDA's Export Awards: 2000-2001

MPEDA's export awards for 2000-2001 were presented by Mr. Rajiv Pratap Rudy, Minister of State in the Union Ministry of Commerce and Industry, at a glittering function held in Bhubaneswar on 24 Feb 2002, to all those adjudged by MPEDA as outstanding exporters of marine products. A Report **27**

International Symposium on Fish Nutritional Security in the 21st Century

This Symposium, sponsored by the Indian Fisheries Association and several others, was held at the Central Institute of Fisheries Education, Mumbai from 4 to 6 December 2001. Inaugurated by Prof.(Dr.) M.G.K. Menon, the event turned out to be great. There was an overflowing participation in the event by farmers, scientists, technologists and others and there were profound and focal presentations made by experts. These evoked avid interest and attention of the participants and also provoked meaningful discussions. A ten page Report **53**

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MARCH 2002

FISHING CHIMES

Tuna Fishing in Indian EEZ: Training Needs

It is learnt that there are 20 used foreign tuna longliners, whose ownership has been acquired by Indian enterprises, and one more under a joint venture which are presently in operation in Indian EEZ. Information on the zones of Indian EEZ in which these liners are operating, the species of tuna they are harvesting, their average weight range and quantities harvested is hard to come by. This information, provided tuna caught by these vessels is being exported, should be there with Customs/MPEDA and with Fishery Survey of India in case the consignments are inspected by its scientists. Prime of MPEDA of recent months does not include particulars of tuna exports. Apparently no tuna exports have been taking place.

There is a general impression that Indian - owned tuna and other foreign vessels imported recently and added to the Indian fleet tend to operate in total isolation from the mainstream of the Indian fleet. This trend is probably attributable to the fact that most of the crew on these vessels are of foreign origin and the operations are directly export-oriented, the exports taking place probably on their own bottom, unlike the other Indian vessels which do not undertake tuna fishing. The general system of Indian vessels is to sell their catches to Indian processors or their agents.

- Information on the types of used foreign longliners acquired by certain Indian companies, i.e., whether of multi or monofilament style, and length of line, number of hooks operated, areas of operation and other relevant details would be of great value to entrepreneurship, now longing to equip their shrimp trawlers with tuna longlining equipment. MPEDA has already initiated a pilot scheme, in association with the Association of Indian Fishery Industries, for equipping two privately owned shrimp trawlers with monofilament long lining equipment, to operate 72 km of monofilament long line (60 km effectively) with around 1,500 branch lines. These vessels, so upgraded, are expected to be operational by May 2002 or even earlier. It is possible that the needed number of foreign crew members, having knowledge of the grounds and the operations will be employed to work on the vessels, particularly because Indian crew have little experience in tuna fishing and knowledge of tuna grounds. The operations can be expected to yield encouraging results. The dissemination of information on the results and the operational aspect of these upgraded vessels and in respect of the operation of the newly acquired used foreign tuna longliners by Indian enterprises would enable the owners of other trawlers to add longlining equipment to their vessels too.

CIFNET imparts to its students practical training in trawling and other fishing methods including longlining. Now that the future opportunities lie in the directon of monofilament longlining, it is desirable to add to CIFNET's fleet monofilamant longliners too. It would also be a sound training proposition to add multi-purpose vessels equipped for stern trawling and also monofilament longlining. Each of CIFNET's Centres can be provided with one such training vessel for providing onboard training to the candidates undergoing the course. Such a step will facilitate imparting of training in monofil longlining, in careful retrieval of fish and their transfer into the hold, proper preservation of tuna, and removal from the hold, and unloading in a correct manner.

There are very few captains in the country who have experience in monofilamant longlining. Once CIFNET equips itself to impart training in monofilamant longlining, interested skippers of fishing vessels can be given an opportunity to receive refresher or regular training in monofil longlining to meet the demand that may soon arise. In the same way, instructors at CIFNET may be deputed to countries such as Australia/ USA to receive onboard training in monofil longlining at the concerned training centres in those countries. Such a step would provide a sound orientation to operations under tuna monofil longline operational training programme. Quick action by the government in this direction would enable CIFNET to provide trained candidates to the industry, by the time the present fleet of trawlers get equipped with tuna longlining system and new tuna longliners are added to the fleet.

ADDENDUM

*[to the paper entitled 'Role of Microbial Biotechnology in Shrimp Larval Rearing' (P 41-44 of Jan/Feb 2002 issue of **Fishing Chimes**)]*

At page 44 of Jan/Feb 2002 issue the following Additional Reference may be noted at the end of Col 3 under the sub-caption 'Further Reading'.

TRINADHA BABU, B., PRABHAKARA RAO, Y, and MADHAVI, R. 2001.Alarming luminous disease in shrimp hatcheries. *Fishing Chimes* 21 (**4**):22-27.

The inadvertant omission of this reference at pre-press stage as part of the paper mentioned above and the consequential inconvenience caused is regretted. Details are as follows :

1. ***Paper published in** Fishing Chimes*, Vol 10 & 11 (Jan & Feb 2002).

2. ***Name of the Paper*** : Role of Microbial Biotechnology in Shrimp Larval Rearing (P 41-44).

3. ***Authors*** : B. Trinadha Babu, Y. Prabhakara Rao and R. Madhavi.

4. ***Addition*** : To be made at P. 44, col 3, after 'TRINADHA BABU, B., PRABHAKARA RAO, Y, and MADHAVI, R'. 2000. Virulent *Vibrio* problems in shrimp aquaculture. *Fishing Chimes* **20**(8): 49-52.

Singapore Seafood Exhibition & Seafood Processing Asia and Global Shrimp OP: 2001 & Global Shrimp Outlook: 2001

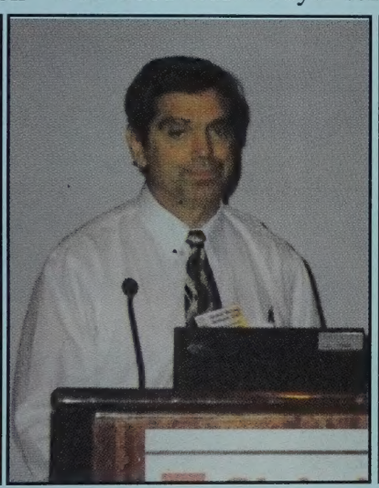
International Convention & Exhibition Centre Singapore, 27-29 November 2001.

The opening of Singapore Seafood Exhibition & Seafood Processing Asia as well as Global Shrimp OP: 2001 & Global Shrimp Outlook: 2001 took place concurrently on 27 Nov 2001 at the International Convention Centre, Singapore. Largely participated, the events were opened by the Guest of Honour, Mr.Chan Soo Sen, Parliamentary Secretary, Singapore Prime Minister's office and Minister of Community Development and Sports, Singapore. There was an impressive presence of Indian delegates at the event.

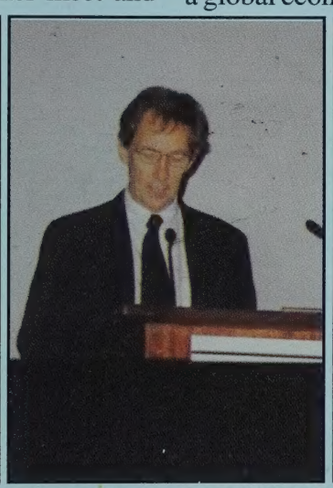
While Singapore Seafood Exhibition & Seafood Processing Asia were principally organised by Singapore Seafood Exporters' Association, supported by the Singapore Fisheries Department and others, Global Shrimp OP:2001 and Global Shrimp Outlook were organised by Global Aquaculture Alliance (GAA), USA. In organising Global Shrimp OP:2001 GAA had the benefit of sponsorship by six leading global enterprises specialising in various supplies and services to the aquaculture sector. These were: Zeigler, Grobest, Inve, Biofend, Aire O_2, and Cargill Animal Nutrition. Global Outlook 2001 was a buyer-seller meet and participation in the event was severely restricted to the registered delegates. Mr.Peh Kheing Siong, of Dai Air Food Company and Council member of Seafood Industries Association of Singapore, while welcoming the guest of honour and the participants, said that regional and national companies from 21 countries were participating in the events.

Speaking next, Mr.Wan Hoon Sang, President, Seafood Exporters' Association, Singapore, observed that, after the earlier Singapore Seafood Exhibition which was held in 2000, there had been a global economic slowdown which con-

Chan Soo Sen, Parliamentary Secy. to P.M. of Singapore



George W. Chamberlain President, G.A.A.



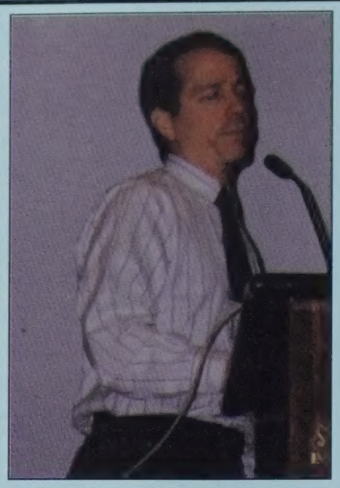
Nigel Preston, CSIRO Australia

Peter Crocos, CSIRO, Australia

Delegates from India

Thampi Samraj of MPEDA in a meeting with Nigel Preston

Daniel Fegan, National Centre for Genetic Engg. and Bio-tech., Bangkok



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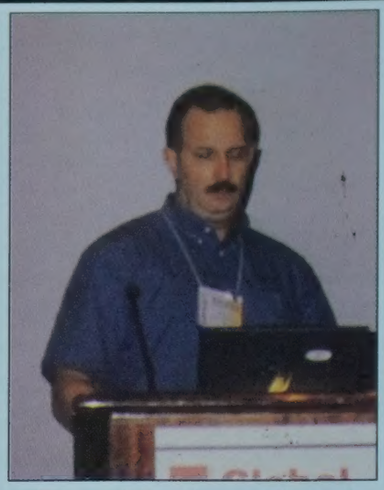
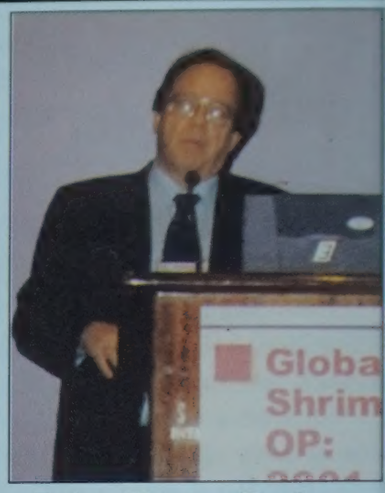


Darryl E. Jory, Global Aquaculture Aliance



Brian Hunter, Roche Aquaculture Centre, Asia-Pacific, Bangkok

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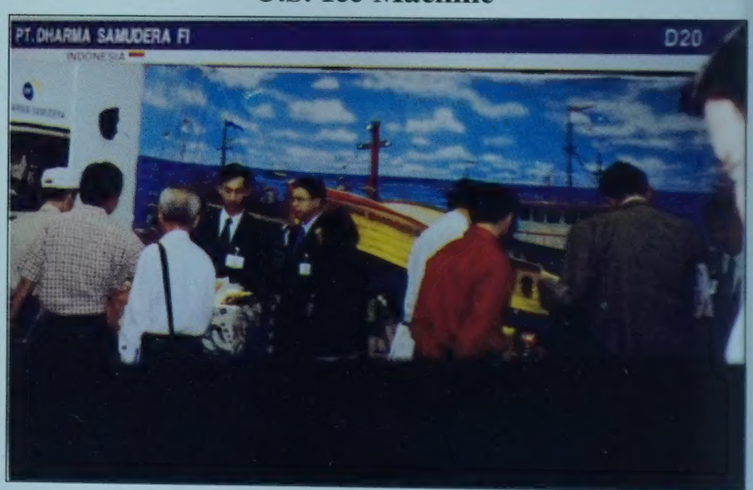

P.T. Dharma Samudera FI, Indonesia

tinued to persist. Braving these uncertain conditions, the present show was put up, with determination, he pointed out. Explaining that the setback to the industry was temporary, he articulated the need for a long range view, considering that the recent turn of events were indicative of revival of business activities. It was mentioned with some measure of pride that Singapore, because of its easy accesibility to world markets, had become an ideal location for processing and export of aquaproducts and for their import. New markets were coming up and the outlook was good, he concluded.

Mr. Lee Wen Tong, in his following address, saying that 51 countries displayed their products at the exhibition, added that in the year 2000 Singapore imported 175,000 t and exported

105,000 t of fish products. It was pointed out that Singapore was developing as the hub of aquafood trade with special accent on aquacultured products.

Inaugural Address : Delivering inaugural address, Mr.Chan Soo Sen highlighted the recent trends of diversifying imports of fish products and also of gaining access to new markets, in Singapore. He expressed the view that seafood industry of Singapore would expand in consonance with the growth of global fish processing industry. Referring to the trend in Singapore of getting seafood from outside for consumption at home and also of eating outside in restaurants and other eating places, he said that the trend was to be welcomed as increase in fish consumption was good for brain cells. He was happy that availability of Cod and other cold water fishes in areas outside their production zones through imports had led to globalisation of eating habits. As a result, for instance, cold water fish preparations were offered in seafood restauarants of Singapore, he said. Dealing with sustainability, the Secretary expressed his unhappiness that there was over exploitation of fishery resources because of several boats chasing the same stock. It was also pointed out that lot of waste took place as 70 percent of low value catches were discarded by trawlers for the reason that storage space in them was precious. Emphasising the need for development of value-added products, he exhorted the industry to face this challange. A specific suggestion made by him in this context to the industry was to export fish and fish products to South Africa in the same way as Cod was being exported from Vancouver to Hongkong and Singapore. Reminding that fishing was the earliest form of human activity, the Secretary said in conclusion that fisheries sector offered enormous opportunities for launching new products and for finding new customers. Hoping that the industry would make remarkable strides in the new millinnium, he said 'If there is a will, there is a way and let us find the way'.

Mr. Chan Soo Sen later declared open the Singapore Seafood Exhibition & Seafood Processing Asia, at Global Shrimp OP: 2001& Global Shrimp Outlook: 2001. MPEDA of India set up a stall at the Exhibition which had attracted a large number of visitors.

Global Shrimp OP: 2001

George Chamberlain, Chairman, Global Aquaculture Alliance (GAA) welcomed the overflowing number of delegates who converged to participate in the event replete with several presentations by specialists. He explained that Global Shrimp Outlook 2001, the other event held concurrently, was meant for major processors and buyers. In contrast Global Shrimp OP: 2001 dealt with operating procedures in respect of 18 component parts of shrimp aquaculture, of which genetic improvement of cultivated shrimp was an import one, more so from the networking point of view. He said that GAA asked eastern and western experts to develop questionnaires in respect of the various component parts of shrimp aquaculture. With these as the basis, a comprehensive survey was conducted to identify successful practices and technologies for all phases of the shrimp production process. He hoped that the participants would know more what works, through updated survey results of the topic concerned. He added that the conference would also feature commercial programmes for genetic improvement of shrimp. It was mentioned that in the light of 450 answers to the questionnaires received and the result of the presentations at the conference, it was hoped to finalise the report by March/April 2002 and bring it out as the best among the available manuals on the subject. Concluding, Chamberlain reminded the participants about the growing importance of food security and the ongoing intensification of contaminant checks on imported foods by USFDA.

With Dr. Peter Crocos of CSIRO Marine Research, Cleveland, Queensland, Australia as the sessional chairman, Nigel Preston of CSIRO, Australia, presented a paper on Responsible Shrimp farming authored by himself and Henry Clifford of Super Shrimp Group, San Diego, California, USA. The presentation covered components and principles of shrimp genetic improvement programme and current practices and future potential of shrimp culture as revealed by GAA survey. One conclusion of the survey mentioned by him was that 60 percent of farmed tiger shrimp *(Penaeus monodon)* of same age were found to be of different sizes because of genetic reasons. It was accordingly concluded that selective breeding programmes were relevant to this shrimp. Several of the respondents depending on wild broodstock, conducted viral/genetic screening for the selection of Specific Pathogen Free (SPF) brooders. Genetic markers and physical tags were attached by them to selected SPF brooders which were stocked in farms. Based on their performance in the farm, Specific Pathogen Free (SPF) brooders, taking into account quality traits, were selected and subjected to viral challenges by these respondents.

After viral screening, the selected brooders, which formed founder stock, were bred. The resultant post larvae were again screened for any viral infection. Thereafter the post-larvae were transferred to nursery ponds. After this nursery phase of adequate duration, the post-larvae were released into production ponds. Nested PCR tests were conducted on specimens taken as samples from the production ponds. Tiger shrimp post-larvae sampled from Mekong Delta were seen to be predominantly infected (53-61%) with yellow head complex viruses, with a lesser percentage infected with WSSV complex viruses.

Genetic improvement components utilised by several respodents included controlled biosecure environment in maturation, spawning, larval rearing and grow-out ponds, differences in spawning performance including egg production per spawning in respect of wild as well as domesticated broodstock. Their reports revealed that reproductive performance of domesticated broodstock *P.monodon* was more or less uniform.

Preston's presentation included types and application of DNA markers used by a section of respondents. Speaking on Type I markers, he said that these related

to physical markers such as eye tags attached to wild broodstock for viral and genetic screening so as to determine their SPF stocks. So far as Type II markers are concerned, he said that these helped in pedegree determination, genetic mapping etc. He also spoke on efficiency of microsatellite marker and its application, analysis of genetic distance, taking into account possible source of founder population, microsatellite distance, amplified frequency length polymorphism (AFLP), application of AFLP markers, genetic linkage maps, quantitative trait locel QRT, DNA markers and their application etc., as elicited from some of the respondents. The survey revealed that 70% of the respondents had been practising selective breeding/domestication of shrimp. It was a revelation when he mentioned that two respondents in Brazil were using domesticated shrimp stocks for breeding for 20 years, one respondent in New Caledonia for 18 years, 14 of them in USA for 17 years, three in Colombia for 14 years, 6 in Venezuela for ten years and 11 of them in Ecuador for 8 years. In Australia, two respondents reported using domesticated shrimp for breeding for six years and another two for two years. Preston projected the following table (Table 1) that gave the geographic distribution of respondents and approximate number of years each country had been utilising domesticated shrimp stocks, mostly of *P.monodon*, *L.chinensis* and *L.japonicus* in the east and *L.Vannamei* and *L.stylirostris* in the Americas.

Table 1. Geographic distribution of respondents and approximate number of years each country has been utilizing domesticated shrimp stocks.

Country	November of Respondents	Years using Domesticated Shrimp
Americas		
Belize	2	3
Brazil	2	20
Colombia	3	15
Costa Rica	2	6
Dominica Republic	1	4
Ecuador	11	8
Guatemala	1	3
Honduras	6	7
Mexico	7	7
Nicaragua	1	3
Panama	3	3
United States	14	17
Venezuela	6	10
Asia-Africa		
Australia	2	6
India	2	2
Indonesia	1	Unknown
Japan	1	Unknown
Madagascar	1	Unknown
Malaysia	6	Unknown
New Caledonia	1	18
Saudi Arabia	1	Unknown
Taiwan	1	Unknown
Thailand	1	6

Preston said that, when asked to rate the biosecurity of their selective breeding facilities, 16% of the respondents rated their facilities as not biosecure, 59% as moderately biosecure, and only 25% claimed that their facilities were highly biosecure. The later group consisted mainly of companies that specialized in marketing specific-pathogen-free postlarvae. Growers using open ponds could make few claims of biosecure operation.

Selective breeding was mostly advanced for *L. vannamei*, the species farmed by 80% of the survey respondents. The number of years of breeding *L. vannamei* ranged from two to 17, with an averge of eight years (compared to an average of three years for Eastern breeding programmes). The majority of captive breeding programmes (65%) were based on in-house breeding, he elaborated.

In the West, the development of disease-resistant lines, improved production efficiency, and reduced dependency on wild stocks were the highest selective breeding priorities, the speaker said. The majority of breeding programmes (64%) were started with domesticated stocks. Panama was cited by him as the most popular source of wild *L.vannamei* founder stocks, followed by Mexico and Ecuador.

It was mentioned that most of the breeding programmes in the West included screening of founder stocks, most notably for White Spot Syndrome Virus, Taura Syndrome Virus, and Infectious Hypodermal and Haematopoietic Necrosis Virus. However, some breeding programmes did not cover viral screening, it was clarified. Some of the survey respondents from the East reported that they also screened for Manodon Baculorivus and Yellow Head Virus, he explained.

Pointing out broodstock production systems included ponds, raceways, tanks and combinations of these systems, Preston said that about 16% of respondents rated their selective-breeding facilities as not biosecure, and 59% as moderately biosecure. Only 25% claimed their facilities were highly biosecure. The latter group consisted mainly of companies that specialised in marketing SPF broodstock, or those that produced certified disease-free postlarvae.

Preston said that almost half the survey participants based their selective breeding programmes on mass selection. Some(17%) used family selection, and others (10%) used a combination of mass selection and family selection. In the West, artificial insemination was commonly used to achieve specific matings for breeding programmes.

Family-based breeding programmes used a variety of methods for tracing families, including eyestalk tags and injectable elastomer markers, it was pointed out. Only one commercial

breeder reported the use of genetic DNA to track families. The survey identified the development of disease resistance, increased growth rates, increased genetic diversity in captive-bred stocks, and protection of genetic lines (e.g., sterilization) as research priorities, Preston mentioned in conclusion.

A presentation on the topic 'Genetic Improvement of Shrimp' was made by Wang Quingyin of Yellow Sea Fisheries Research Institute, Quingdo, China. Pointing out that wild sea shrimp were caught in the depth range of 80-100 m, he said that, while *Penaeus monodon, Fenneropenaeus pencillatum, F. merquiensis, Litopenaeus vannamei, Metapenaeus affinis* and *M.ensis* were caught from waters off South China, *E.chinensis* and *M.japonicus* were caught from waters off North China. It was mentioned that during the year 2000, in Northern China, nearly 129,449 ha were brought under shrimp culture with a unit production of 447.5 kg per ha. Explaining that comprehensive measures were taken to remove these constraints by undertaking genetic breeding of *F.chinensis* through techniques of selective breeding, he added that this was done by mass selection and family selection and that transgenic shrimp were produced by adopting gene engineering technique. He said that the aim of selective breeding was to generate strains characterised by resistance to diseases, improved growth rate, fast growth and better quality. It was added that selection had been completed upto the fifth generation of *F.chinensis*. With a selection intensity of 1-3%, a population of 20,000 shrimps were chosen. Of these, 2000 nos of spawners with a length of >15cm were first separated, and through a further selection, 300 spawners were bred after administering a thermal shock, resulting in a progeny of 20 million post-larvae. These were reared in nursery tanks to a length of 2.5-3.0 cm. Pathogen analysis was carried out at different growth stages. In this manner the successive generations, through selective breeding, were raised. The specimens of the final generation grew to an average body length of 13.58 cm with an average weight of 33.49 cm, Wang Quingyin said.

Pointing out that disease, environmental detereoration, and lack of new farming varieties as the major constraints in shrimp farming development in China, he said that comprehensive measures were taken to tackle them through genetic breeding and pathogen control. It was mentioned that selective breeding (mass selection, family pedegree selection) and gene engineering technique (transgenic shrimp) were used for genetic breeding of *F.chinensis*.

Diseased Broodstock used with good progeny survival: Speaking on selective breeding, he said that, since 1998, raising of five generations of selectively bred *F.chinensis* was completed. Upto 4th generation seriously disease ridden broodstock was used for breeding. A good percentage survived and these were used to raise the 5th generation. The result was that after four generations of selection by Oct 2000, cultured shrimp (*F.chinensis*) with a body weight increase of 20.55% and body length increase of 7.69% were produced. It was pointed out that selective breeding gave rise to disease resistant population. Progeny of selected broodstock was good with a high percentage of survival. Molecular marker techniques were used for selection of brooders. The resultant fertilised eggs were treated with thermal shock. Flocylometer was used for checking triploids in the fertilised eggs. At the time of harvest of ponds, stocked with the progeny, around 3:1 ratio between females and males was seen, he explained.

Saying that further research work was being continued with emphasis on management of water quality, he added that WSSV gene probe kit was developed and several training courses were conducted on its use. Production of immunostimulants was taken up. Farm pond bioremediation system was developed through selection of bacterial strains with specific functions. High health larval rearing was pursued through a green house set up for nursery culture of shrimp larvae. High health PLs so produced alone were utilised for stocking grow-out ponds, it was clarified.

The presentation made by him was exclusively in respect of *Fenneropenaeus chinensis* and the procedure followed by the author might facilitate adjustments in the on going work in respect of domestication of tiger shrimp in South Asia and elsewhere.

The presentation that followed was on an overview of selective breeding programme of *L.vannamei* in Columbia by Nicolas de Castillo, CENIACUA, CSIRO Marine Laboratories, Australia, conducted in collaboration with AKVAFORSK of Norway. Broodstock from nine countries imported from Hawaii of USA, Venezuela, Ecuador, Panama, and Columbia was pooled up and subjected to selective breeding. He said that, during the course of this work F_2 mature shrimp were subjected to WSSV challenge and those that withstood three to six WSSV challenge tests were selected to form the broodstock. In family selection, the predicted response from growouts stocked with the progeny was 6.5 percent per generation for harvested weights and 1.1% for general pond survival.

Maturation

The next presentation was on 'Maturation' by Peter Crocos of CSIRO Mairne Research - Cleveland, Queensland, Australia. The objectives of the survey on maturation conducted by him were to highlight current approaches to shrimp maturation and to identify emerging technologies to improve production. So far 34 respondents from Western Hemisphere countries and 14 from the Eastern Hemisphere answered maturation-related questions, he said.

Observing that *Litopenaeus vannamei* was the most commonly cultured shrimp, as reflected by the higher proportion of Western respondents, and that ten respondents cultured *Penaeus monodon* in India, Indonesia, Madagascar, Saudi Arabia and Australia, Crocos said that about 82% of the respondents used broodstock from captive populations, including all respondents that cul-

tured *L.vannamei* and *L.stylirostris*.

In contrast, only 18% of the respondents used wild shrimp, explained Crocos. These respondents were all from the Eastern Hemisphere, where they cultured *P.monodon* or *P.japonicus*. This trend reflected a major difference between Eastern and Western Hemisphere, and between species, with domestication of *L.vannemei* more advanced in the West, he pointed out.

Most of the respondents had five to 50 maturation tanks at their facilities. The tanks were typically round and lined with plastic. Most respondents used tanks of 5-20 m^3 volume and 0.2-0.6 m in depth. It was further mentioned that about 32% of the respondents relied on flow-through water, whereas 68% used partial or complete water recirculation. For those respondents who recirculated water, the most common types of filtration were fluidised bed filters and pressurised sand filters, Crocos elaborated. He went on to say that most respondents stocked six or more broodstock per m^3 of water, and most (68%) stocked equal numbers of males and females. The majority of the respondents fed broodstock by percent of body weight, with squid and polychaete worms as the majority dietary components. The most common method to induce spawning was eyestalk ablation (84%). None of the respondents used hormones to induce ovarian development, he explained.

Most of the respondents reported it took four to seven days from induction of spawning to the first spawning, and most reported that 5-8% of the females spawned per night. He had also mentioned the majority of respondents reported that females achieved six or more spawns and produced 100,000-200,000 eggs per spawn, but this was biased by the number of respondents using *L.vannamei*, according to him. Nine percent of respondents, all of whom cultured *P.monodon*, reported that females produced 300,000 to 500,000 eggs per spawn, he explained.

Of the respondents who used both wild and domesticated stocks, most of them reported that domesticated stocks (all *L.vannamei*) had better survival (77%), showed less of fright response (100%), had higher rates of spawning (67%), produced more spawn per female (77%), and exhibited higher hatching rates (73%), Crocos said.

The most common biosecurity strategy consisted of viral screening, use of disinfected water, and employing some type of quarantine procedure. About 30% of the respondents used SPF shrimp or purchased shrimp from an established SPF source. Interestingly, Crocos said that about 17% of respondents did not resort to any form of biosecurity.

Most respondents(58%) felt that research on broodstock growout and preconditioning should receive the highest priority. The survey revealed that research on hormonal manipulation and spawning systems should receive the lowest priority, Crocos pointed out.

In the light of disease problems plaguing the global shrimp farming industry, and opportunities for genetic improvement, there had been fundamental changes in the way broodstock managers operated their maturation facilities. Having said this, the speaker explained that use of domesticated stocks from SPF sources had increased and that biosecure protocols were now common, same way as the use of recirculating water supply systems. It was apparent to him that these approaches were more advanced in the Western Hemisphere, where the predominant species grown was *L.vannamei*. Similar advances must now be acheived for *P.monodon* and other species in the Eastern Hemisphere was his closing remark.

Larval Rearing

Daniel Fegan of National Centre for Genetic Engineering and Biotechnology, Bangkok, spoke on this topic. Of the 60 respondents to the larval rearing questionnaire of the Global Shrimp OP:2001 survey, he said that 58% were from the Western Hemisphere (WH) and 42% from the Eastern Hemisphere(EH). Most of them represented integrated companies that had been in operation for more than five years, and most of them were working to control viral disease problems and to implement selective breeding programmes. Not surprisingly, most EH hatcheries produced *Penaeus monodon*, while most WH hatcheries produced *Litopenaeus vannamei*, it was pointed out. The following were the other points made.

a) EH hatcheries generally had smaller capacity (1-50 million PL/month) compared to WH hatcheries (11-200 million/month). The majority of Eastern Hemisphere hatcheries had 21-50 tanks. Typical tank volume ranged 5-15 mt. Nearly all (97%) EH hatcheries were equipped with nursery tanks, as compared to only 57% of WH hatcheries.

b) Water use generally fell in the range of 50-500 mt/day. Chlorination and ultraviolet exposure were the most common means of treating effluent.

c) Viral disease monitoring was an area of growing concern. EH hatcheries primarily screened broodstock, larvae, or postlarvae for White Spot Syndrome Virus and Monodon Baculovirus, while WH hatcheries screened for WSSV, Taura Syndrome Virus, and Infectious Hypodermal and Hematopoietic Necrosis Virus. Methods for viral screening included dot blot tests and PCR techniques.

d) Most of the hatcheries (72%) reported rinsing nauplii in iodine solution and clean seawater before stocking in larval-rearing tanks. Even a higher percentage (83%) reported using iodine compounds to externally disinfect nauplii before stocking. Only 12% reported prophylactic treatment of nauplii with antibiotics prior to stocking.

e) WH hatcheries tended to stock at somewhat higher densities (100/150/lt) than EH hatcheries (50-125/lt). However, WH hatcheries generally harvested at $PL_{<12}$ as compared to PL_{13-20} in the EH.

f) The primary microalgal species used by most hatcheries for feeding was *Chaetoceros*. EH hatcheries tended to maintain target densities of 10,000-100,000 cells/ml at Zoea 2 stage, while WH hatcheries maintained 100,000-200,000 cells/ml. Although batch algae

culture was the method favoured by most of the hatcheries, a substantial portion of the respondents used continuous culture and batch culture methods.

g) Increase in the cost of Artemia cysts had prompted their partial replacement with other feeds, including microencapsulated and microparticulate diets, liquid diets, flake diets, and other products. Most hatcheries reported a reduction in the use of Artemia over the past two years. EH hatcheries varied in Artemia use from less than 1-9 kg/million PL, while WH consistently reported use of 1-3 kg/million PL.

h) The method often used to assess PL quality included stress tests, evaluation of gill development, size, and external fouling. The top quality control methods were direct microscopic observation, water-quality monitoring, and bacterial plate counts.

i) Biosecurity was a serious concern for hatcheries. The majority of WH respondents (69%) indicated that they had formal written biosecurity protocols, while only 36% of EH respondents had written protocols but they were informal. Biosecurity measures included controlling the movement of potential disease carriers, disinfection of water and equipment, use of special clothing, etc. The majority of hatcheries were dried out after every production cycle .

Nursery

Randall Aungst of Black Tiger Aquaculture Snd. Bhn. - Kg. Pianggu, Endau, Pahang, Malaysia, made a presentation on shrimp nursery. He prefaced his talk by saying that shrimp farmers were asked to provide answers to the questionnaire given as to how they operated their nurseries and which aspects of nursery production they considered most important. The questionnaire consisted of 32 questions, which were answered by 22 respondents from the Eastern Hamisphere (EH) and 21 from the Western Hemisphere (WH). He summarised the responses as follows:

i) Nursery production ranged from indoor tanks to outdoor ponds. Most EH respondents used indoor systems, while most WH respondents used outdoor systems. Typical operations used 5-20 nursery tanks with a volume of 20-50 mt, a depth of 1.0-1-5 m, and aeration by air diffusion. EH tanks were typically rectangular concrete units, while WH tanks were mainly raceways or round shapes constructed with plastic liners.

ii) Water used to fill nursery tanks was typically chlorinated in the EH, but not so in the WH. Water exchange generally ranged from 10% to over 40%/day. Most WH respondents managed their nurseries with continuous horizontal currents, while less than half of the EH respondents adopted this practice. Temperatures were generally maintained within the range of 26-32° C.

iii) While few respondents in the EH used artificial substrates, nearly 40% did so in the WH. While probiotics were commonly used in the EH, in the WH this practice was not common.

iv) Most respondents used nitrogen, phosphorus, and silicate fertilisers to stimulate production of phytoplankton in nursey tanks. However, few used organic fertilisers to stimulate production of zooplankton.

v) 4-8 day old postlarvae were used for stocking at densities of 10-50/l. Artemia nauplii and dry diets were the most common of the diverse feeds used in nurseries. Feeding rates were adjusted based on number of animals per tank.

vi) Of the many health parameters monitored, animal size, condition, and activity were the most common. Salinity acclimation rate in the EH was generally 1-2 ppt/day, while 3-5 ppt/day was common in the WH. Survival rates in the WH were more common in the range of 76-85%. After harvesting by draining into a net or screened overflow box, PL were usually transported in plastic bags in styrofoam boxes in the EH or in tanks with continuous aeration or oxygen injection in the WH.

vii) Respondents from both the Eastern and Western Hemispheres concurred that nursery phase provided the distinct advantage to produce more robust postlarvae which led to higher survival in ponds. Respondents felt that shortening of the hatchery cycle was almost as important.

Pond Preparation

There was a presentation on 'Pond Preparation' by Victor Suresh, Consultant - Aquaculture/Feed Industry, from India. He prefaced his talk by pointing out that effective pond preparation prior to stocking involved oxidation of organic wastes that accumulated in pond bottoms, disinfection, eradication of predators and disease vectors, improvement of soil pH, and enhancement of natural pond productivity. These objectives, he said, were accomplished through several steps: drying the pond bottom, tilling and applying lime, filtering/chemically treating incoming water, and applying fertilisers. Data on pond preparation collected from 72 shrimp farms around the world were presented. The following points were made during the presentation.

a) Pond preparation strategies were oriented taking into account soil type, pond design and construction, climate, need for biosecurity, and intensity of the culture cycles prior to and after the preparation. Besides the direct costs of materials and labour, pond preparation also involved the indirect cost of excluding a pond out of production for a time. In this context, it was important for aquaculture managers to evaluate the costs and benefits of different pond preparation methods.

b) Half the farms that participated in the survey were from the Eastern Hemisphere, and the other half were from the Western Hemisphere. While the emphasis was primarily on preparation methods practised in the Eastern Hemisphere, a comparison was made with practices in the Western Eamisphere where necessary.

c) Soil composition at farms in both hemispheres was quite similar. About 83% of the farms had clay or silt-clay soil. Nearly 89% of the farms in the East reported to the surveyors they dried their ponds after every culture cycle, whereas only 52% reported so in the West. Farms in the West relied more on drying their ponds in the dry season.

d) Perhaps the relatively small size of the ponds in the East allowed more complete draining and drying of the ponds in the rainy season. This probably explained why farms in the East relied less on chemical treatment of wet areas than those in the West.

e) Tilling or plowing pond bottoms after drying had been advocated for many years. Only 45% of the farms practised tilling or ploughing. Over 93% of the farms applied lime to their ponds. Farms in the East applied lime more frequently than those in the West. A majority of the farms in both hemispheres applied about 500 kg/ha of lime during pond preparation.

f) Nearly 30% of the farms reported that water used for filling ponds was not treated in any manner. Among those that treated the water, 74% of the farms in the West relied on water screening to control the entry of pathogens and predators, whereas only 50% of the farms in the East did so. Farmers in the East, however, relied more on chemical treatment of water than in the West.

g) The survey revealed differences in the methods used to kill aquatic predators. Organic piscicide rotenone was used more for the purpose in the West, while tea seed cake was the usual choice in the East for eradicating aquatic predators. Use of chemical pesticides was very limited in both hemispheres.

h) Farms in the East perceived low nutrient levels in their incoming water compared to those in the West. This, in turn, influenced fertilisation. 97% of farms in the East fertilised their ponds, while only 83% did so in the West. Inorganic fertilizers were preferred over organic fertilizers. Urea was the most preferred form of nitrogen fertilizer, while triple super phosphate was the most preferred source of phosphate in both hemishperes.

i) About 40% of the farms did not have a target level for nitrogen and phosphorus in their waters, while those that did target specific nutrient levels chose greater than 1 ppm N and greater that 0.2 ppm P most frequently. The data suggested that farms in the East fertilised at lower rates than those in the West.

j) Sixty-seven percent of the farms in the East and 53% of those in the West used organic fertilisers. Grain by-products such as rice bran and manure were preferred as organic fertilisers in the East. Molasses were also used by farms in the East, but not as often as in the West, where it was the primary organic fertiliser. Organic fertilisation, in most cases, was done before stocking and in the first 30 days of cycle in the East and throughout the cycle in the West.

Non-Aerated Pond Management

Kenneth Corpron, of Aquaculture de la Mahajamba - Mahajanga, Madagascar, spoke on 'Non-Aerated Pond Management'. The preface to his presentation was: Extensive shrimp farming as traditionally practised in Asia for decades - using tidally influenced ponds with few feed, fertilizer, and even seedstock inputs - continued to be a common method of shrimp culture in many parts of the Eastern Hemisphere. In China, Vietnam, Indonesia, India, the Philippines, and Bangladesh, farms of this type were principally located where land and labour costs were low, and feed and seed were scarce. Neither mechanised aeration, nor even routine exchange of water other than by tidal exchange was practised in such farms. Corpron made the following other important points:

i) Stocking densities were unpredictable, but generally very low, often less than 1-2 animals/m^2. In some instances, farms with access to financing were able to obtain improved yields by stocking hatcheryproduced or wild-collected postlarvae and using limited amounts of feed or fertilizers. Yields from extensive farms rarely exceeded 500 kg/ha/year.

ii) Semi-intensive farming continued to be a prevalent form of shrimp culture among the more established farms of the Western Hemisphere, but many such farms could also be found in Asia and Africa. Semi-intensive shrimp farms were characterised by managed stocking of commerically produced postlarvae into large (greater than 5 ha) ponds at moderate densities, and use of fertilizers, feeds, and water exchange to maintain water quality. Aeration, if employed, was used only on an emergency basis in case of oxygen crisis. Yields from semi-intensive farms ranged from 1,000-3000 kg/ha/crop.

Aerated Pond Management

Yont Musig, Faculty of Fisheries, Kesetsart University, Bangkok, Thailand, spoke on the subject. He said that fifty-two farms had responded to the Global Shrimp OP: 2001 survey on aerated pond management. Among these, 33 respondents were in the Eastern Hemisphere (including 13 from India, seven from Indonesia, three from Malaysia and four from Australia) and 19 respondents were in the Western Hemisphere. Some of the other details given by the speaker were as follows:

a) About half of the surveyed farms were medium-size farms with 11-50 ponds. Twenty-seven percent were small farms with five to ten ponds. Only a small number of farms had less than five or more than 50 ponds. The major cultured species were *Penaeus monodon* (57%) and *Litopenaeus vannamei* (33%).

b) Half of the farms stocked shrimp at densities between 21 and 50 animals/m^2, 31% of the farms stocked shrimp at densities less than 21/m^2, and only 18% of the farm were stocked with shrimp at densities over 50/m^2. Average survial rates in most surveyed farms(77%) were between 51 and 80%.

c) About half the farmers estimated survial rates of shrimp in ponds based on feed consumption from feeding trays, 40% estimated by sampling with cast nets or other means of capture, 2% predicted survival rates based on day of culture, and the rest used other estimating methods.

d) The average length of production cycle was 90-120 days in 47% of the farms and 121-140 days in 45% of the farms. Fifty-four percent of farms harvested two crops per year, while 20% harvested 2.5 crops per year. Average weight of shrimp at harvest was between 10 and 20 g for 31% of the farms and 21-30 g for 47% of the farms.

e) The average yield per cycle was between 2,001 and 5000 kg/ha for 45%

of the farms and 1,001-2000 kg/ha for 22%. Only 25% of the farms had average yields over 5000 kg/ha/cycle.

f) In the Western Hemisphere, most farms (89%) used rectangular ponds, while in the Eastern Hemisphere, 45% of farms used rectangular ponds and 44% used square ponds. Most surveyed farms (64%) had ponds with depths between 1.1 and 1.5 m. 15% percent of the farms used ponds with depths of 0.75-1.0 m, 13% used ponds with depths of 1.51-1.75 m, and only 8% used ponds over 1.75 m deep.

g) Average aeration rates at surveyed farms were mostly between 3 and 10 hp/ha (62%). Only 31% of the farms had average aeration rates higher than 10 hp/ha, and 8% of the farms had rates below 2 hp/ha. Most farmers (71%) estimated their horsepower rating based on motor size.

h) The primary power source for aerators was electricity, either from on-site power generation (42%) or utilities (52%). Fifty five percent of the farms had complete backup power supply, 20% had partial backup, and 21% had no backup. Thirty-two percent of the farms had approximate cost of power less than U.S. $0.05/kwh, and another 32% had power costs of $0.05-0.10/kwh. Twenty-five percent of the farms used diesel fuel, with average costs ranging from less than U.S. $0.20/l to $0.50/lt.

i) Sixty percent of the farmers placed aerators around the outside perimeter of their ponds to create a clean feeding area; 35% of them placed aertors between the outside edge and centre of ponds to reduce sludge area, and 29% placed aerators near corners to prevent the accumulation of waste. Twenty five percent of the farmers placed aerators with all of them pointed in the same direction, and 2% placed aerators in water channels. Over half the respondents placed their highest priority on aeration efficiency when purchasing aeration equipment.

j) Primary reasons given by respondents for using aeration were to increase yields (38%), prevent oxygen kills in semi-intensive ponds where water exchange must be avoided due to disease risk (32%), and continuously resuspend organic material and create heterotrophic microbial communities to purify water and recycle protein (24%). The rest of the farms used aeration for other purposes, he said .

k) Heavy plankton blooms in aerated ponds too occured. 43% of the farmers attributed these to low oxygen conditions despite aeration which was inadequate, 27% of them related the bloom to aerator failure, 18% to power outage and 11% for other conditions.

l) Respondents placed their highest priority for research on the importance of aeration versus circulation, which was ranked first by 43% of the respondents, followed by improvements in gas exchange efficiency by others.

Pond Water Quality

A presentation on 'Pond Water Quality' was made by C.Kwei Lin of Asian Institute of Technology, Bangkok, Thailand. Explaining that as part of the Global Shrimp OP:2001 survey, face-to-face interviews were conducted with 60 shrimp farmers in Thailand and 28 Vietnamese farmers, he said that, in general, Thai shrimp farmers undertook predominantly intensive operations in their ponds, while Vietnamese farmers followed both semi-intensive and intensive culture systems. Thai shrimp farming development was in a stabilising phase, but Vietnamese industry, however, was in a steep rising phase, Kwei Lin added.

A majority of the interviewed farmers were small-scale operators, whose farms consisted of less than five ponds with an average size below 0.5 ha and water depth of 1.1-1.5 m. In terms of years engaged in shrimp culture, 60% of the farmers had more than five years of experience, the speaker told the participants.

It was explained that the source of water for shrimp ponds came from estuaries, open sea, or embayments and that 60-80% of farms had reservoirs or ponds to store source water for sedimentation and/or treatments, before release into growouts. He said that, for pond treatment, 88% of the farmers used liming materials, typically agriculture lime. It was also mentioned that over 60% of the farmers said poor water quality was caused by self-pollution from shrimp culture.

Dealing with intensive operations, the speaker said that the survey results had shown that 50% of the ponds were stocked at 30-50 shrimp/m^2. More than 80% of ponds yielded 3-7 mt/ha/crop in 90-120 day cycles. Over 80% of the farms operated two crops a year. It was also mentioned that water quality parameters of farms i.e., pH (91%), alkalinity (85%), salinity(77%), ammonia (67%), dissolved oxygen (43%), transparency (39%), nitrite (36%) and temperature (35%) were monitored regularly. Explaining further, Kwei Lin said that the alkalinity of most ponds ranged 75-150 mg/lt $Caco_3$, with the greatest frequency in the range of 75-100 mg/l, similar to source water. The pH was maintained at 7-8 (70%) in most of the ponds and above 8 in the others. Liming was used by 80% of farmers to boost alkalinity and pH of pond water, he added.

Since weather conditions in Indo-China exhibited dry and wet cycles, it was mentioned that the most affected water qualities were temperature and salinity, as revealed by the survey. Apprising the participants that cool and dry cycles prevailed during early and late parts of the year, when minimum water temperature could drop below 25° C, he said that during warm periods, maximum temperature exceeded 32° C.

Dwelling on culture seasons, the speaker observed that 80% of the farms operated in both seasons, but most shrimp culture in Vietnam (80%), particularly in the central region, took place only during the warm, rainy season. The prevailing salinity during the rainy season ranged form 2-20 oo/o, and 10-40 oo/o during the dry season. Less than 10% of farmers manipulated salinity by adding salt or brine to increase salinity, or ground water to dilute salinity, it was explained. Another point made was that the majority of ponds were aerated. Minimum dissolved oxygen as measured at dawn, was generally maintained at 2-4 mg/l.

Although nutrients were an important factor that could cause excessive phytoplankton blooms in ponds, he said that these were seldom measured, for want of

special analytical equipment and procedures required. Farmers could do little to correct the undesirable concentrations anyway, he commented.

The daily water exchange varied from less than 2% to greater than 20%. Thai farmers exchanged water less than 2%, while 50% of Vietnamese exchanged greater than 20%, it was pointed out.

One conclusion of the survey mentioned by the speaker was that an array of probiotics was being used by shrimp farmers throughout the region. For instance, nearly 90% and 60% of Vietnamese and Thai farmers respectively used them.

Summarising, Kwei Lin said that, although limited in scope, the results of the survey provided important data on the status of shrimp farming in the region. He explained that the data brought out that a wide range of underlying environmental factors caused variations in pond water quality, and that farmers were learning to improve water quality.

Feed Management

A presentation was made on 'Feed Management' by Darryl Jory of Global Aquaculture Alliance. His introductory observation was that management techniques were as important as feed quality in both semi-intensive and intensive shrimp farming. He pointed out that the feed management portion of the Global Shrimp OP:2001 survey received 94 responses, with 61 responses from 13 countries in the Eastern Hemisphere (EH), and 31 responses from 10 countries in the Western Hemisphere (WH), reflecting this importance. Not all respondents answered every question, he said.

Recalling that protein content was probably the first characteristic of a feed examined by shrimp farmers, Darryl said that nearly all Western respondents used feeds with 35% protein or less, while 87% of Eastern respondents used 36% protein or more. It was mentioned that ninety-four percent of EH producers reported feed hydrostability for 60 or more minutes and that no clear trend in this regard was apparent in the Western Hemisphere. He also said that eighty-three percent of EH respondents used pellets 2.3 mm or less in size, while no clear trend was apparent in the West.

Another aspect mentioned was that most of the producers (85%) did not apply feed before stocking shrimp postlarvae and that most of them (93%) applied feed to stocked ponds every day, with manual broadcasting from boats or embankments, as the most common (92% EH, 58% WH) method. He added that most of the respondents (89% EH, 71% WH) required 1-4 manhours/ha/day for feed application. Only two of them (WH) required 9 or more man-hours/day, it was explained. Stating that about 56% of respondents increased the number of daily feedings as growth cycle progressed, he observed that, according to the responses, more producers did so in the EH (67%) than the WH (35%). Ninty two percent of EH producers fed shrimps four times or more at times of maximum feeding, while 81% of WH respondents fed them 3 times/day or less. Nearly all EH respondents fed shrimps during both day and night, while only 30% of WH producers did so, he added.

Explaining the results of the study in respect of feed containers used, the speaker said that 94% of EH producers used 10 or fewer trays/ha, while 39% of WH respondents used 11 or more trays/ha. Only five respondents used mechanical devices to apply feeds, he added.

Most respondents (94% EH, 87% WH) based feeding rates on feed consumption from feeding trays, or in combination with survival estimates, average size, and feeding tables. Pointing out this, Derryl explained that low dissolved oxygen levels were the factor used to adjust feed quantity in feeding trays by 33% of respondents, while 21% adjusted rates during extreme water temperatures, 20% used excessive plankton blooms as a reference, and 16% used other factors.

Observing that interim results showed convergence on such aspects of feed management as use of daily feeding and feeding trays, and no application of feed before stocking, the speaker said that major variations still existed in many areas, which reflected the diversity of production systems and a lack of available information on performance differences among various approaches. Concluding, Derryl opined that feed management practices should ultimately be species, system, area, and even season-specific to optimise production efficiency, minimise environmental impact, and maximise biosecurity.

Disease Testing and Treatment

There was a presentation on 'Disease Testing & Treatment' by Timothy Flegel, Faculty of Science, Mahidol University, Bangkok. He explained that the purpose of the disease testing and treatment section of the Global Shrimp OP:2001 survey was to determine the current world impact of disease on shrimp farming and the status of diease control measures taken at the farms. It was mentioned that the response to the survey was limited to 19 respondents from seven countries in the EH and 27 from 10 countries in the WH, but it was felt that this response was perhaps sufficient to indicate general trends.

Pointing out that the study results showed that mean disease losses were 16% in the East and 28% in the West, the speaker said that big losses appeared to be more common both in the West and East. A correlation analysis indicated significant negative correlation and some degree of inconsistency in the reporting for the two, he added.

With respect to disease agents, it was mentioned that viruses ranked top in proportionate cause of losses and appeared to be more severe in the West (71%) than the East (41%). Losses from bacteria ranked a far second for both East and West. Other pathogenic agents were relatively insignificant and few reported losses due to known agents, it was observed.

Survey responses from East and West were pooled by GAA to examine whether the percent of shrimp production lost due to disease was correlated with aspects of farm design or operation. An analysis showed that significant positive relationships were found between percent lost and the age of ponds and between percent lost and pond surface area, but the strength of these correlations was weak (r^2=0.24 and 0.16 respectively), it was

pointed out. A negative correlation was found between percent lost and stocking density, but the strength of this correlation also was weak (r^2=0.15), said Timothy Flegel.

With a few exceptions, trends for determining health status in the East and West were similar. Saying so, the speaker pointed out that most of the farms used gross examinations and considered them proportionately reliable. At the same time, some of the farms used microscopic examinations and considered them proportionately reliable, although the use of stains in rapid examinations was surprisingly low (50-60%). It was further mentioned that histological examination of tissue sections showed greater popularity (64%) in the West than in the East (28%). Use of microbial culture and identification was approximately 50% for both East and West, it was added.

With respect to molecular methods, the speaker said that use of dot blot assays was much more common in the West (52%) than in the East (22%). PCR use was more common in the EH (41%) than dot blots, but use of dot blots still lagged behind PCR use in the WH (72%). Use of *in situ* hybridisation and immo-blot assays was low in both the East and West, although proportionally higher in the West. It was mentioned that, for both types of tests, the response of "no opinion" was around 50%, perhaps indicating lack of familiarity with the methods.

Antibiotic use was similar for EH and WH, with "not used" and "seldom used" collectively accounting for 90% of responses overall. Giving these facts, the speaker said that, when used, efficacy was reported as good (about 40% overall) or variable (about 60% overall). One conclusion he mentioned was that use of probiotics contrasted sharply between East and West, with 87% use in the former and only 36% in the later. He added that few considered them to be ineffective, although the effectiveness was given as variable or good by 40-60%.

The other conclusions were that use of vaccines for eight bacteria or viruses was very low and that inquiry concerning negative factors for disease control brought a relatively poor response from the WH, but with better response from the EH. Overall needs were generally higher in the East, and equipment ranked as the top need for both regions. In addition, multiple needs tended to be more frequent in the East, he said.

Concluding, the speaker said that about 35% of respondents overall indicated that there were no barriers to acquistion of equipment. However, some did indicate high cost and location were the most common (40-40%) given for both East and West.

Effluent Water Quality

The next presentation was made on 'Effluent Water Quality', by Christopher Jackson, CSIRO Marine Research, Cleveland, Queensland, Australia. Pointing out that many governments were issuing effluent permits to shrimp farms and for other aquaculture operations, in order to limit pollution of coastal water ways, he said that many of the best management practices (BMPs) recommended by GAA were intended to reduce pollution by improving the quality of pond effluents and reducing their volume.

Stating that the survey was intended to highlight current worldwide practices with regard to effluent management and quality, the speaker said that 34 responses had been obtained, with 11 of the responses (32%) from the Eastern Hemisphere.

Clarifying that only about half of the respondents were required by the government concerned to have an effluent permit, he said that the respondents who indicated the requirement of an effluent permit came from a range of countries in both the East and West. A requirement to monitor water quality also was imposed on 43% of respondents. Some respondents (two from the Eastern Hemisphere, and five from the Western), while having no requirement for effluent monitoring, nevertheless had a voluntary monitoring programme, it was explained.

The study revealed that effluent samples usually were collected by farm staff and then analysed either at the shrimp farm or sent to a private or government laboratory. In only two cases (in Indonesia and Venezuela) there was a system of a regulatory agency visiting the farm, taking effluent samples, and analysing them. Reporting of effluent quality data was normally done at intervals of one month or less, although a small number of permits allowed reporting quarterly or even less frequently, he explained.

Sixty percent of respondents were attempting to reduce water exchange (most of them aiming at less than 3% per day), and 27% indicated their current average water exchange was already 2% per day or less, he said. More than half (60%) exchanged less than 5% per day, he said.

Half of the respondents reported that they had set up settling basins and that all but one were installed voluntarily. Explaining this, the speaker said that most of the settling basins had a hydraulic retention time of less than 24 hours, although two respondents reported greater than 48 hours. In about half the cases, the settling basins were used to treat effluents before discharge into natural water bodies, while the remainder also used them to treat water before reuse, it was clarified.

The speaker explained that four farms reused a small proportion (less than 25%) of their exchange water, and one farm (from Belize) reused more than 75%. The remaining 23 farms did not reuse exchanged water at all. He added that three farms (from Indonesia, Texas in USA and Belize in Brazil) also reused water drained from the ponds at harvest time.

It was also mentioned that 20% responded by saying that they cultured other species (fish, bivalves, or seaweed) in discharge canals or settling basins to improve water quality. While most reported that this practice did not generate sigificant income, one Indonesian farm indicated fish grown in their settling basin generated more than 20% of net profit.

The speaker concluded his presentation by saying that there were other encouraging signs to show that the environmental performance of shrimp farming was improving. Farmers were attempting to reduce water exchange rates, many

farmers voluntarily installed settling basins, and some farmers reused water after exchange or harvest discharge.

New Production Technologies

The presentation on this topic made by Yaram Avnimelech had its focus on low and zero water exchange. According to him the traditional shrimp culture was problematic in itself. A high level of water exchange, commonly practised in the past, posed adverse effects on the environment, and at the same time it was unhealthy and potentially induced disease carriers into the pond.

The solution, he said, was to farm shrimp in a closed recirculation system with low or zero exchange. He asserted that this was also the best way to reduce pollution associated with shrimp farming. He had pointed out that the survey results showed that the farmers in Asia and the Western Hemisphere alike were reducing water exchange from 10-20% per day in 1998 to less than 5% now and more were adopting the zero exchange system. This trend was confirmed by the other survey under the Effluent Water Quality topic, reported at the conference by Dr. Christopher Jackson of CSIRO Marine Research in Australia, he added.

He recalled what Jackson said: In addition to the reduction of water exchange, half of the farmers responding to the survey had the settling basins in place in order to treat effluent before discharge into natural water sources.

Avnimelech highlighted that the adoption of low and zero water exchange systems brought about the need to manage the pond environment effectively. And this led to a new concept of aerating and positioning of aerators in a manner to avoid unaerated areas and resuspend the sludge accumulated on the pond bottom.

As disease was of great concern to the farmers, Avnimelech pointed out that water screening and disinfection had become a standard practice in Asia and the West.

He said that more than half of the farmers responding to his survey indicated that they used finer and finer nets to filter incoming water, particularly in Asia where net as fine as 150 micron (0.15mm) was used. Chlorination was a common method in water disinfection adopted in both regions.

The bearish trend of shrimp prices had been the motive behind efforts in increasing productivity of shrimp in Asia and worldwide, according to Avnimelech. The feed cost in Asia was relatively higher than in the other regions as its main farming species was black tiger shrimp, which required a higher inclusion of protein in the diet, he explained.

Avnimelech's survey revealed that the average protein level of the shrimp feed in Asia was stable at 38% since 1998, whereas in the Western Hemisphere it lowered down to 35.5% as at present.

The speaker opined that switching from algal to microbial control in the pond would be an opportunity to reduce protein in the shrimp feed as heterotrophic bacteria when introduced could increase natural food by the system of recycling protein to be used by the shrimp. Thus, the feed cost could be lowered as there was no need to use high protein diets, he said.

It was mentioned that the survey results had also shown that the farmers in Asia had begun using carbohydrate (molasses or cassava) to recycle protein and the microbial control would play a greater role in the future, particularly in the closed system of farming.

Avnimelech also explained that the microbial control method had many advantages over the algal control system. Besides the ability to recycle protein, he said, bacteria did not produce energy, would digest organic residue, and they were stable and not affected by light.

However, the speaker did not relate the use of bacteria with probiotics. Though it was indicated in another survey presented at the conference that most farmers in Asia applied probiotics, he said that their effectiveness still needed more evidence to support.

According to him, new technologies such as pond lining, artificial substrate and settling basin could help the farmers to increase productivity and efficiency substantially.

He explained that pond lining, for instance, enabled farmers to raise shrimp on any type of soil, provided clean surfaces and minimised idle time between crops. He added that, in spite of proven efficacy, adoption of these technologies, called in questions of cost effectiveness and integration with the existing farming facilities.

Speaking on sources of information relied on by farmers, Avnimelech said that specialist publications and meetings had been the most important source of information on new technologies for shrimp farmers. He added that new production technologies were being sought by the farmers worldwide as they strived to increase productivity and comply with stringent environmental regulations. He observed that the data gathered from participating shrimp farmers from the East and West had shown that the main source of information on new technologies for them were specialist publications such as trade magazines and technical bulletins, and meetings and conferences, where independent experts were invited to speak on the technologies. It was also mentioned that the specialist publications and meetings were also the source of information that the farmers trusted. The farmers tended to seek information on new technologies from the specialist publications and meetings because they believed that these sources were in the nature of third party with no direct interest in the products, he added.

Feed Manufacturing

A pesentation on 'Feed Manufacturing' was made by George Chamberlain, Chairman, Global Aquaculture Alliance. This presentation summarised the status and priorities of the shrimp feed manufacturing sector as determined from interim results of the Global Shrimp OP:2001 Survey. Stating that out of 46 respondents to the questionnaire, 34 were feed manufacturers, three were ingredient vendors, three were researchers, and four were companies involved in feed dis-

tribution or process automation and control, Chamberlain told the participants that around 40% of the respondents served markets in both hemispheres, while 30% of the respondents served only one country either in EH or WH. It was clarified that out of the feed manufacturers, 13 were from the EH and seven from WH. Fourteen served both hemispheres, he added.

Dwelling further on the results of the survey, the chairman said that only 55% of responding feed manufacturers indicated the use of least-cost formulation. It was observed that, in order to more accurately account for the nutrient content of feeds, it was important to take into account the nutrient digestibility of raw materials. It was also mentioned that, in the survey, 69% of shrimp feed manufacturers indicated that they formulated feeds on a digestible-nutrient basis. 42% indicated that they had reduced fish meal quantity in shrimp feeds over the last three years.

It was pointed out that, for achieving pellet stability, ingredients must be finely ground and starches well cooked. Hammermills, which could achieve moderate size reduction of particles, were used by 62% of respondents. Pulverisers, which could achieve much finer size reduction, were used by 52% of respondents. The combination of hammermills and pulverisers was used by 28% of respondents, it was clarified. Another survey result mentioned was that extended steam conditioning was used by 45% of manufacturers, as compared to 38% still using standard conditioning systems.

Continuing, Chamberlain said that only 66% of the respondents used compression pellet mills for forming feed particles, while 31% indicated use of extruders, and 17% used both. A recent development in shrimp feed manufacturing mentioned was the use of post-pellet conditioners, which essentially held the newly formed pellets at temperatures around 80-90° C for 10-30 minutes before cooling, to further increase starch gelatinization and water stability. Forty-eight percent of respondents indicated use of post-pellet conditioners, it was mentioned.

Observing that a continuous issue over the years had been how to measure water stability in order to compare results among various manufacturers, he outlined the responses to the survey. Of the 39 respondents who answered the question about water-stability methods, 64% indicated that they measured stability by immersing pellets for a standard time followed by visual examination of pellet disintegration. A more quantitative measuring system based on immersion and standardised agitation, followed by drying and calculation of dry matter loss was used by 26% of respondents. Nearly all (93%) favoured development of a standardised water stability test to allow comparison of results, he explained.

Another result of survey mentioned was that 58% of the surveyed feed manufacturers from both EH and WH already offered special feeds for use in intensive culture ponds with low water exchange.

The chairman told the participants that the respondents were invited to select their top research priorities from a list of 16 possibilities. Responding to this request, they reported the most important areas for research were studies of species-specific essential amino acid requirement, immunostimulants, probiotics, vaccines, attractants, fishmeal substitutes, and pellet binders, he told the participants.

Mangrove Conservation

Victor Rivera-Monroy, University of Louisiana, Lafeyette, Louisiana, USA, spoke on 'Mangrove Conservation'. He said that successful management plans for tropical and subtropical regions would depend on the ability of resource managers to integrate the diverse functions of natural resources, such as mangroves and estuaries, with activities like shrimp aquaculture so as to ensure sustained economic development.

The speaker said that the shrimp-farming industry was generally aware that mangrove forests were not the best sites to build shrimp farms and that these forests provided ecological "goods and services" (e.g., effluent treatment, water quality, erosion control) that helped in achieving optimal shrimp pond management. In addition, governmental regulations were being developed or enforced to protect mangrove forests.

He said that while 19 respondents participated in the survey from the WH, only 9 respondents took part from the EH.

The speaker said that most (74%) of the shrimp farms that provided answers were not built in mangrove areas. He added that the results did however show a wide diversity of human activities had impacted mangroves in each region, including urban and industrial development, wood collection by local communities, salt production, tanning, effluent water from the shrimp farms, cane farming, and river sedimentation.

The study revealed, said Victor, that in those cases where mangroves were destroyed in the construction of farms, 50% of EH farms and 82% of WH farms indicated that mangroves were replanted. Replanting was generally on the basis of two or three new mangroves for each one cut. The primary species replanted was red mangrove. Most replantings were considered successful, he informed.

Respondents overwhelmingly reported that mangroves in their regions were protected by government regulations, and most felt that the regulations allowed good development of shrimp farming, the speaker reported.

Although survey respondents perceived that mangroves could provide such benefits as protection from storm surges, treatment of effluent, habitat for wild larvae, and others, only a minority reported efforts to participate with public or educational institutions in developing plans for mangrove conservation programmes, the speaker said in conclusion.

Feed Additives

A presentation on 'Feed Additives' was made by Brian Hunter, Roche Aquaculture Centre, Asia Pacific - Bangkok, Thailand. Pointing out that Global Shrimp OP:2001 survey on shrimp feed additives included 110 additives considered to represent the most ☞

common minor ingredients used in shrimp feeds, and that this list was not, however, exhaustive, he said that over 2,500 food additives were registered by the United States Food and Drug Administration alone.

Brian Hunter sait that a total of 107 survey responses had been received from the feed industry, 53 from EH and 54 from WH. 46% of respondents were dedicated additive manufacturers or vendors, and the bulk of the rest were feed manufacturers. He explained that 49% of EH respondents and 74% of WH respondents served both hemispheres. 92% of respondents targeted fish feeds as well as shrimp feeds, and 59% of respondents also targeted poultry feeds. Proceeding further on the topic, Brian said that, out of 22.4% of all responses, the most frequent of them were from attractant suppliers, followed by binder suppliers (15%) and sources for immunostimulants (10.7%), lipids, and pigments (6.5% each).

Additives with the most robust growth (greater than 20% per year overall), revealed in the survey were nucleotides, bile acids, cholesterol, mineral premixes, vitamin premixes, vitamin-mineral premixes, and monophosphate derivatives of vitamin C (ascorbyl phosphates). Fish hydrolysates, shrimp meal, squid liver powder, and squid meal (EH only), artificial flovours, and immunostimulants showed intermediate growth of 5-20% per year.

It was mentioned that certain technology application problems limited the use of some of desirable additives in shrimp feeds. He said that live bacterial cultures, some immunostimulants, vaccines and enzymes were particularly heat-sensitive, and proved to be partially or totally destroyed under typical shrimp feed pelleting or extrusion. It was also pointed out that top coating of finished shrimp feed pellets with heat-labile ingredients could present a viable alternative for inclusion in feed mash prior to pelleting. Top-coating methods had not, however, been perfected, he said.

The speaker projected application rates for shrimp feed additives as recommended by manufacturers or vendors who participated in the survey as given in Table II.

Lab Procedures and Services

The presentation on the captioned topic too was made by Timothy Flegel, Faculty of Science, Mahidol University, Bangkok, Thailand. At the outset of the presetation, Flegel said that survey of lab procedures and services was designed to determine the world status of current diagnostic infrastructure for shrimp farming for the purpose of monitoring major pathogens, stock certification, and routine diagnostic applications. Additional questions were also released to measure interest and to perceive need for a laboratory accreditation programme.

The speaker said that thirteen labs from the East (in six countries) and 34 from the West (10 countries) responded to the survey. Saying that, although response to the survey was too limited to give a strong representation to current status, it was observed that perhaps it was sufficient to indicate general trends.

One trend for both EH and WH that was noticed as a result of the survey was that laboratories processed a large numbers of specimens. Pointing out this, Flegel told the participants that, in both hemispheres, government and research laboratories dominated (about 60% overall), while there were proportionally more profit-oriented laboratories in the East which were more than farm-oriented laboratories in the West. Trends for number of employees were very similar, he said, indicating a predominance of small operations of 1-5 staff members.

In regard to capabilities, more laboratories from the West (94%) carried out histological analysis than those in the

Table II

Additive	% of diet	Additive	% of diet
Crab meal	2-3%	Hydrocolloid binders	0.2-1%
Fish hydrolysates	2-5%	Urea formaldehyde	0.3-0.8%
Fish solubles	2-5%	Wheat gluten	3-10%
Krill meal	1-5%	Artificial flavours	0.3-0.6%
Meat solubles	1-30%	Other starch binders	5-15%
Shrimp head/shell meals	3-15%	Lignin sulphonate	0.1-1%
Squid liver powder	1-3%	Methionine analog	0.1%
Squid meal	1-3%	Astaxanthin	15-100ppm
Nucleotides	1-6%	Beta carotene	50-100ppm
Amino acid composite	0.6-1%	Canthaxanthin	60-90 ppm
Isoflavones	200-500ppm	Marigold pigments	80-120ppm
Bacterial extracts	0.1-0.5%	Beta glucans	0.1-2%
Blood plasma	0.5-2%	Paprika	0.5-3%
Seaweed by-products	0.1-5%	*Spirulina*	80-150ppm
Yeast	1-5%	Maninoligosaccharides	0.1-0.4%
Live bacterial cultures	3.33ppm-0.1%	Zanthophyll source	5-10%
Mycotoxin absorbers	0.1-0.5%	Zooplankton	80-120ppm
Yucca extract	250-500ppm	Ethoxyquin	125ppm
Bile acids	0.1%	Mould inhibitors	0.05-0.15%
Cholesterol	0.1%-1%	Ammonia absorbers	0.1-2ppm
De-oiled lecithin	0.5-5%	Mineral premix	0.1-1%
Fluid lecithin	0.5-8%	Vitamin premix	0.1-0.5%
Phospholipids	0.6-3.7%	Vitamin-mineral premix	0.2-0.8%
Schizochytrium	0.5-4%	Coated vitamin C	150-2,000ppm
	(contd ...)	Ascorbyl phosphate	250-500ppm

East (56%). Pointing out this, he said that both tended to do antibiograms, although more frequently in the West (94%) than the East (72%). Capability for bacterial identification was similar in both hemispheres (about 70% overall), although there was a tendency for the use of more kits in the West (41%) than in the East (21%), he added.

In terms of molecular diagnostic reagents, DNA dot blots were used more extensively in the West (90%) than in the East (50%), Timothy said, adding that this was also true for *in situ* hybridization (West 97%, East 42%). With respect to reagents, trends were very similar in East and West, with most reagents being purchased as kits from a single company, it was explained.

Regarding PCR, its capabilities were generally similar both in the East and the West, with tests for WSSV and YHV dominating in both. Bringing out this position, the speaker observed that testing the TSV was more common in the West and that for HPV was more common in the East. Use of PCR kits was higher in the West (95%) than in the East (60%), and reagents were purchased mostly from one supplier for both, he mentioned.

Concluding, the speaker said that most of the laboratories were willing to take part in a ring test (about 90% overall), although 39% of the laboratories in the East indicated a wish to delay this until later.

Estuarine Water Quality Monitoring

The presentation on the subject of 'Estuarine Water Quality Monitoring' was made by Siri Tookwinas Waraporn Prompoj, Department of Fisheries, Bangkok, Thailand. He said that awareness of Estuarine Water Quality was important because estuaries served not only as the source of water for ponds, but often as the destination of farm effluents. It was mentioned that continued development and longevity of shrimp aquaculture was dependent on high quality water and its source. Overdevelopment of shrimp farms, either through management intensification or increased pond area, along a water course could deteriorate estuarine water quality to levels unacceptable for shrimp farming, he told the participants.

He emphasised the importance of monitoring receiving water quality to detect any systematic degradation in quality and to assist in the regulation, if necessary, of quantities of release into the water course. Shrimp farmers, government personnel, and other parties could obtain data on estuarine water quality through a systematically designed monitoring programme, he suggested.

Although active estuarine water quality monitoring programmes of various scopes were in place worldwide, he expressed unhappiness that only a handful of respondents participated in this section of the survey. He hoped that his presentation would primarily focus on monitoring activities as practised in Thailand.

Recalling that estuarine water quality monitoring programmes in Thailand began in 1991 along 21 coastal provinces, he said that the Thai Department of Fisheries provided mobile units from its Coastal Aquaculture Division to collect monthly water samples. Samples were analysed for physical, chemical, and biological parameters including pH, temperature, salinity, dissolved oxygen, biological oxygen demand, ammonia, nitrite, and plankton, he elaborated.

Referring to the results of four years (1996,1998,1999 and 2000), he said that estuarine water quality analyses showed that overall water quality in Thailand was still suitable for coastal aquaculture, with the exception of some of the water areas around the inner Gulf of Thailand and on the east coast which contained slightly high BOD levels. The BOD load could be due to the domestic and industrial waste discharges from cities and municipalities.

In order to improve water quality, the speaker recommended remedial measures for the future to control discharge from municipal, industrial, agricultural and aquaculture sources. In this context, he said that the Department of Fisheries had introduced on-farm water treatment such as water discharge systems and biological treatments to minimise nutrients in aquaculture effluents. Thailand's Code of Conduct for sustainable shrimp farming had also been applied, he clarified. He had also mentioned that shrimp farmers were gradually adopting the practices, which would in turn help in the maintenance of water quality for both farms and coastal environments.

Estuarine Carrying Capacity

The presentation on the captioned topic was made by George Chambarlain on behalf of George Ward, Centre for Research in Water Resources, University of Texas, Austin, Texas, USA. The presentation went as follows: To the shrimp-farming industry, carrying capacity was the maximum level of shrimp farm development a watercourse could accommodate without excessive water quality degradation. Carrying capacity was limited by the natural water quality of a system and any other sources of contamination. It addressed not only the physical area of shrimp farms, but also their density and geographical distribution along a watercourse. Of some concern were shrimp-farming industries established on estuary water courses , whose exchange with seawater could be so constrained that the carrying capacity would become substantially less than the potential farm development needs, based upon suitable land and infrastructure. In these cases, it was mandatory that the carrying capacity of the estuary be established in advance, and used to manage the development of new shrimp farms. Estuary water quality was measured by a set of biochemical parameters affected by the estuary's complicated circulation processes. These included the effects of tides, density of currents, meteorology, and river flows that drained into the estuary.

The water quality parameters usually of concern to shrimp operations were organic waste products, nutrients (which stimulated excess algae growth), and toxics. The central technology employed

in their measurement was application of a mathematical model, a quantitative depiction of transport and kinetic processes, implemented on a digital computer. Such models consisted of a numerical solution of hydrodynamic and mass transport equations, carried out by schematising the estuary into many small segments. The models required inputs of estuary physiography, hydraulics, and inflows, as well as parameters of bacterial and algal kinetics, and natural sources of organic loading. Perhaps, the most important aspect of a mathematical model was the specification of biochemical processes, dictated, in turn, by which water-quality parameters must be modeled. Shrimp pond operation must be quantatively characterised, including area and volume of ponds, volume and frequency of exchange, and concentrations of key chemical parameters. These, in turn, were governed by feeding strategies and pond-management practices. While mathemetical models had been used for over three decades to assess waste load impacts and set limits for discharges in estuaries throughout the world, little use had been made of modeling in the planning and siting of shrimp farms.

The conference came to a close after a panel discussion at which the significant points made by the various experts were highlighted.

Global Shrimp Outlook: 2001

Over 75 of the world's top shrimp buyers and sellers represented 19 countries at Global Shrimp Outlook: 2001, an informative new conference programme organised by the Global Aquaculture Alliance. The reports presented at the event detailed current industry conditions and projected future production and price scenarios. In short, experts representing the top 12 shrimp-producing countries and shrimp fisheries provided accurate, timely production summaries and projections.

Key experts from the United States, Japan, Europe and China explained current and future shrimp demand in the retail, food service and distribution sectors. Finally, Dr.James Anderson of the University of Rhode Island factored country-by-country production figures into a quantitative economic model to project future pricing in each of the primary markets.

Exhibition

There were a total of 73 stalls well arranged in the 4th level of the Singapore International Convention & Exhibition Centre. The stalls were occupied by processors of South East Asian Region, America, South Asia and also Government Departments, International Organizations, Seafood Associations, associated industry suppliers etc. The important exhibitors included : 1) M/s.Red Marine Enterprise Pte Limited, Singapore; 2) M/s.PT Dharma Samudera Fishing Industries, Indonesia; 3) M/s.Speak Industries Association of Singapore; 4) M/s.Seapack Food Sdn. Bhd, Malaysia; 5) M/s.Snorre Food Pte Limited, Singapore; and 6) M/s.Tristar General Trading Company Limited, Myanmar.

In the MPEDA both the following items of seafood were displayed: i) Shrimps:Block frozen PUD, Blanched H/L IQF brown, H/L IQF brown / IQF PD shrimp; ii) Cephalopods: Cuttle fish (block frozen), IQF Cuttle fish fillets, whole and whole cleaned squid (block frozen), IQF squid rings, Whole octopus (frozen); iii) Fin fishes: White and Black pomfret, Mackerel, Ribbon fish, Seer fish, Snaper etc.; iv) Other crustaceans: Crab meat, Cut crab, IQF lobster, frozen lobster tails, Scampi (whole frozen) & IQF; v) Mussels, Clam meat (Frozen).

In addition to the frozen items displayed, charts pertaining to various seafood items were also properly depicted in the stall alongwith the commercial fish/ornamental fish chart of India. Leaflets displayed on 'Guidelines for sustainable shrimp farming', Effluent treatment system, Code of practices for hatcheries also received good attention from the visitors especially from aquaculturists/government agencies.

The products displayed had generated much of interest among the visitors and nearly 60 and odd on the spot enquiries were received. Indian Embassy Officials, Indian Exporters, shrimp farmers, hatchery operators, fishery consultants, chemical dealers visited MPEDA stall. The important seafood exporters who visited MPEDA's stall included:

1) Messers. O.T.Alexander, M/s.National Seafoods Company, Kochi; 2) M/s.K.Brahmanandam, M/s.Devi Seafoods, Visakhapatnam; 3) Ashok Nanjappa, M/s.Waterbase, Chennai; 4) M.Sundarshan Swamy, M/s.Santir Aqua, Visakhapatnam; 5) A.Indra Kumar, M/s. Avanti Feeds, Kovvur; 6) Boonyarit Yeesam, General Manager, M/s.C.P Aquaculture India Ltd., Chennai; 7) Dr. S.Vasudevan, Aquaculture Consultant, M/s. Hiline Aqua chem Chennai; 8) Sushant Velka, Director, Tim Tim Far East Export Trading Company Limited, Mumbai.

The following important persons also visited the stall apart from trade visitors: 1. Mr. Najib Shah, IFS, First Secretary, Indian Embassy, Singapore; 2. Mr. Sri Kumar Menon, Commercial Attache, Indian Embassy, Singapore; 3. Dr. P.K.Reddy, Marine Breeding Centre Agri-Veetthanam Authority of Singapore; 4. Dr. K.R.Dinesh, Quality Control Manager, M/s.BTC Bioprocessing Technologies Centre, Singapore Biotech Park. 5. Mr. Wong Peng Hoh, President Singapore Industries Association, Singapore; 6. Mr.Pramod Ranjan, M/s.Oriental Link Private Limited, Australia; 7. Mr.B.A.Nayeem, Seville Products Limited, Sharjah, UAE; 8. Mr. M.Ganesan, MD, M/s.Fishcorp (M) Sdn.Bhd., Malaysia.; 9. Mr. Tajudeen Kassim, M/s Bancath Marine Products Sdn. Bhd., Malaysia.; 10. Mr. Hantowo T Jhia. S.E, M/s.P.T.Lola Mina seafood, Indonesia; 11. Mr.Menaga Meyyappan, M/s.South India Seafood Company, London, UK.; 12.Mr. Manjo Mathew, AL Jazira Marine Resources Limited, Republic of Yemen.

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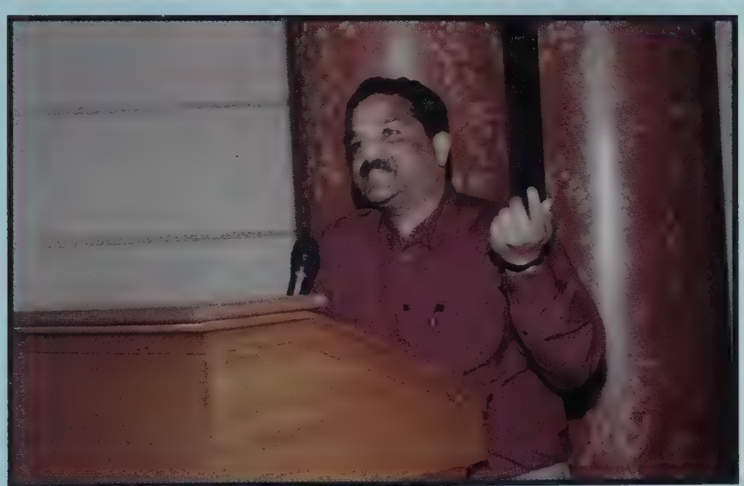
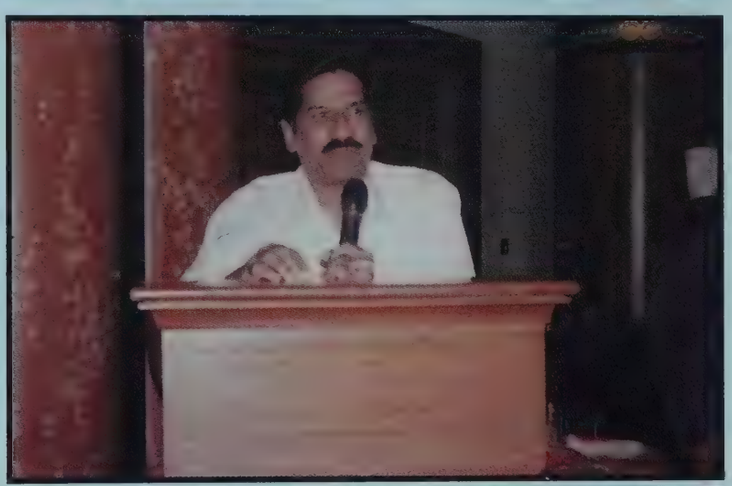
Hotel Grand Bay; Visakhapatnam
21 December 2001.

The Association of Indian Fishery Industries, conferred **LIFETIME ACHIEVEMENT AWARDS** on three of its distinguished members at a function organised on 21 Dec 2001 at Hotel Grand Bay, Visakhapatnam. The members of the Association, most of them with their families, participated in the event.

◄— 1) *Brig. S.K. Aggarwal, Vice-President of the Association, as the master of ceremonies, reapprised the members about the purpose of the function. Recalling the glorious landmarks in the history of the Association and the dedicated contributions made by some of its members, he announced that the Association had decided to honour three of such members who had devoted their lifetime for the development of the Indian Deepsea Fishing Industry, recording momentous achievements. Welcoming the participants, he requested the President of the Association, Mr. T.Raghunath Reddy to announce the names of the awardees and set in motion the awards conferment programme.*



↑ 2) *Mr. T. Raghunath Reddy, President, AIFI, referred to the general consensus among the members that it was the duty and responsibility of the Association to honour such of its members who had a record of outstanding achievements which strengthened and moved the industry forward. He announced that, as a follow-up, the Association identified three of its distinguished members for the conferment of Lifetime Achievement Awards. Amidst applause, he announced the names of the members chosen for the conferment of the Awards as (a) Mr. J.V.H.Dixitulu, (b) Mr. N.S.H.Prasad and (c) Dr. C.Babu Rao. Articulating that the outstanding contributions made by the three members upgraded the Industry and set new standards of service to be emulated by the others, he requested Messers. V.Padmanabham, M. Sivaram, and Y. Surya Rao respectively to highlight the lifetime achievements of Mr. J.V.H.Dixitulu, Mr. N.S.H.Prasad & Dr. C.Babu Rao, in that order, in the service of the fisheries sector.*



↑ 3) *Mr. V.Padmanabham, Managing Director, Sharmila Fisheries Ltd, Director, East Coast Marine Products Ltd, former Vice-President and presently Member of the Executive Committee of A.I.F.I recounted the achievements of Mr. J.V.H.Dixitulu as follows: 1) Motivated M/s. Fish Products Ltd, Kakinada in late fifties to set up its processing plant, the first one in A.P ; 2) Set up a large number of fish farms in A.P. including the brackishwater fish farm at Kakinada; 3) Acclaimed as the progenitor of Fish Farmers Development Agencies in India; 4) Recognised as the person who imparted stature to Indian marine fishing industry by introducing through import in late 1970s for the first time 28 nos of larger fishing vessels of 23m LoA; and, 5) After retirement from government service established the fisheries journal Fishing Chimes, and gained the distinction of being the first Indian fisheries journalist. Padmanabham said "The name 'Dixitulu' stands enshrined in the History of Fisheries Development of India".*

4) Mrs. N.S.R. Murthy presenting a bouquet to Mr. Dixitulu. Mr. N.S.R.Murthy, Managing Director, Nekkanti Seafoods Ltd, Visakhapatnam, a leading Indian exporter of marine products is to the right of (behind) Mr. Dixitulu. Brig. S.K.Aggarwal looks on.

5) Capt. M.G.Michael handing over to Mr. Dixitulu the Lifetime Achievement Award conferred on him by the President, A.I.F.I.

6) Mr. J.V.H.Dixitulu responding to the conferment of the Award. He thanked the Association for the recognition accorded for the services rendered by him to the industry and said that he would cherish the unique honour. He conveyed his gratitude to Mr. V.Padmanabham for the distinctive narration of his (Mr.Dixitulu) achievements.

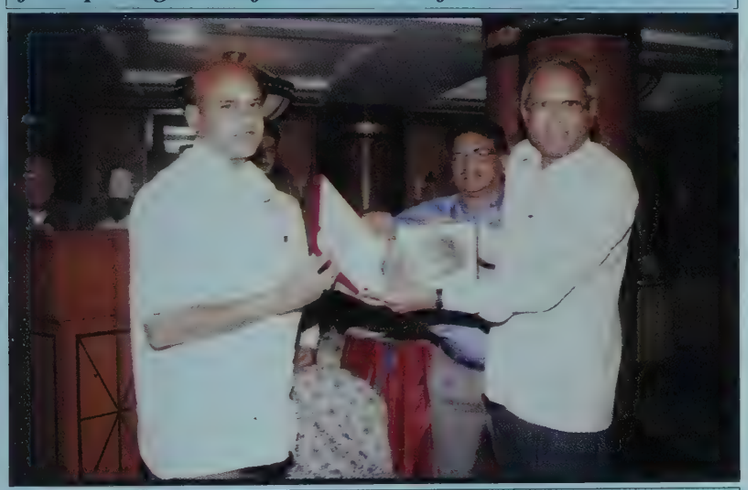
7) Mr. M.Sivaram, Managing Director, Samro Food Processors, and second Vice-President of A.I.F.I, has focused on the signal achievements of Mr. N.S.H. Prasad. He has highlighted Mr. Prasad's achievement of being the first to venture into sea fishing with a mechanised boat along upper east coast in late sixties, thereby providing an historic fillip to the Industry. He added: later Mr. Prasad started integrated operations with four large trawlers and a processing plant. Several new entrants into the sector emulated his example. He was the President of A.I.F.I. for several years.

8) Mrs. Reeda Fernando, Director, Reeda Marines Ltd felicitating Mr. N.S.H.Prasad with presentation of a bouquet.

9) Mr. J.Arul Roy, Managing Director, Crown Fisheries Ltd, handing over to Mr. N.S.H.Prasad the Lifetime Achievement Award conferred on him by President, A.I.F.I.

10) *Mr. N.S.H.Prasad responding to the honour bestowed on him and expressing gratitude for the conferment of the prestigious Lifetime Award of the A.I.F.I. on him.*

11) *Mr. Y. Surya Rao, President, Seafood Exporters Association of India, A.P. Region, (3rd from left) admired the selfless services rendered by Dr. C.Babu Rao (2nd left) to the fishing industry, both as President of AIFI for a long time and also as a well wisher of the Industry. Visualising that the Indian marine fishing industry has no long range future in shrimp fishing, he said that Dr. Babu Rao was the first to diversify into fishing for lobsters, deepsea prawns and cephalopods in the western EEZ of India and in the EEZ of Myanmar, thereby motivating others to follow him. His unique efforts subsequently led him to undertake fishing in the EEZ of Indonesia. His enterprising spirit stands as a historic symbol of his untiring efforts to project India as an international fishing power, Surya Rao said. Mrs. Y.Surya Rao (extreme left) later felicitated Dr. Babu Rao by presenting him with a bouquet.*



12) *Mr. B.Srinivasa Rao, Managing Director, S.B.S. Marines Limited and Secretary, Association of Indian Fishery Industries handing over to Dr.C.Babu Rao Lifetime Achievement Award conferred on him by the President, AIFI. Brig. S.K. Aggarwal is at the podium. Mr. M. Sivaram is behind Dr. C. Babu Rao, joining Mr. Srinivasa Rao in handing over the Award to Dr. C. Babu Rao.*

13) *L to R : Messers. T. Raghunath Reddy, President, A.I.F.I., Y. Surya Rao, President, Seafood Exporters Association of India, A.P. Region, Mr. M. Sivaram, second Vice-President, A.I.F.I., and Mr. Ch. Veerabhadra Rao, Member, SEAI, A.P. Region*

14) *Family members of the Chiefs of the Deepsea fishing Industry who participated actively in the event.*

15) *Dr. C.Babu Rao, while responding, profusely thanked the Association, for the honour showered on him. Considering the present alarming situation in the industry and the entry of a large number of foreign vessels in the garb of Indian ownership for fishing in the Indian EEZ, he exhorted the Association and its members to work out the needed policy guidelines and strategies for promoting the industry on healthy, sustainable and profitable lines and in that light prevail upon the government to adopt them.*

16) *Some of the members of the Association sitting in a semi-circle and relaxing along with Mr. T.Raghunath Reddy, President of AIFI (sitting on the left in front). Next to him are Mr. N. Subbarayadu, Mr. Ch. Veerabhadra Rao, Mr. Ch. Rajagopal Chaudhury, Mr. K. Srinivasa Reddy and the other distinguished members. On the opposite right from the front are Messers. D.Prabhakar, A.S.Narayana, Y.Surya Rao and N.S.R.Murthy.*

17) *The Awards Recipients snapped together. L to R : Dr. C. Babu Rao , Mr. N.S.H. Prasad and Mr. J.V.H. Dixitulu.*

18) **Post-event Merriment** : *Brig S.K.Aggarwal and Capt. T.I.Victor Fernando*

19) **Post-event Jubilation** : *Mr. Arul Roy and Capt. M.G.Michael.*

20) **Post-event Closeness** : *Brig S.K.Aggarwal with Capt. R.M. Fernando.*

MPEDA'S Export Awards 2000-2001

Hotel Swosti Plaza: Bhubaneswar : 24-2-2002

MPEDA's Export Awards for 2000-'01 were presented at a glittering function held at Hotel Swosti Plaza, Bhubaneswar, with Prof. (Dr.) Prasanna Patasani, M.P as the Chairman of the award function. It was for the first time that such a function was held at Bhubaneswar. Orissa contributes substantially to the exports of Indian marine products. Mr. Rajiv Pratap Rudy, Ministry of Commerce and Industry in the Union Minister of State was the chief guest. Mr. Kirnamoy Nanda, Minister for Fisheries, West Bengal was the guest of honour.

Mr. Jose Cyriac, Chairman, MPEDA, welcomed the participants. Emphasising the importance of Orissa in the sea food industry of India, he mentioned that it was for the first time that a function of this importance in the marine products export sector was being held in Bhubaneswar. He spoke about the Indian marine products industry, describing it as at crossroads but moving resolutely ahead with a lot of ground to be covered, especially with respect to processing of value-added products. He indicated that a lot of Indian products continued to be exported to certain countries where they were being reprocessed for export to other countries with value addition.

Mr. Rajib Pratap Rudy, Union Minister of State for Commerce and Industry addressing the participants other Dignitaries on the dais. L to R : Mr. Jose Cyriac, Chairman, MPEDA, Mr. Ranjit Bhattacharya, Secy. General, SEAI, Prof (Dr.) Prasanna Patasani, M.P. and others

The Chairman explained that exposure to losses due to price fluctuations could be minimised by increasingly taking up processing of value-added products. Pointing out that, while the recent down trend had hardly affected some countries due to adoption of this value-addition strategy, he observed that India too was in a good position to impart more and more value addition of marine products. The total marine products export turnover of India could be easily increased by another Rs.2,000 crores with value-addition by packers. It was pointed out that MPEDA would put in all needed efforts in ushering in this trend.

He spoke appreciatively of the keen interest evinced by the Union Minister of State in the Ministry of Commerce, Mr. Rajiv Pratap Rudy, in promoting the cause of value-added exports on the lines of the new proposals put forth by MPEDA.

Mr. Ranjit Bhattacharya, Secretary General, Seafood Exporters Association, highlighted the importance of utilising the opportunities of rich fishery resources of Indian waters in a sustainable manner. He said that this would not only help in increasing GDP but would also earn precious foreign exchange and add to nutritional security and forex earnings of the country.

He appealed to the government of India to consider favourably reduction of prices of diesel oil supplied to small-mechanised boat operators in the same way as was being done in the case of deep-sea trawlers. He explained that cost of diesel constituted 70% of total operational cost of mechanised boats, and the small fishermen were unable to have adequate returns to meet even the cost of fuel. Further, he indicated the importance of quality of catch which could be stepped up only by way of improving infrastructure facilities at various ports.

Bhattacharya also laid emphasis on the need for conservation of fishery resources especially those occurring upto 50 fathom depth. He appealed for extending marketing support for value-added products.

In his presidential address Prof.(Dr.) Prasanna Patasani spoke on the importance of augmenting incomes and improving quality of life of fishermen by way of enabling them to undertake shrimp farming. He also highlighted the potential of areas around Chilika lake for taking up shrimp culture.

Mr. Kiranmoy Nanda, Minister of Fisheries, West Bengal, who was the guest of honour, speaking on the occasion, pointed out the increasing trend of exports to USA from West Bengal and also the various development programmes taken up in respect of marine products exports from West Bengal. He also apprised the participants about the upsurge in fish culture in the State. The increasing contribution of West Bengal towards ornamental fish exports was highlighted by him, pointing out that 90% of ornamental fish exports from the State was accomplished with fishes brought in from other eastern and north eastern States.

Mr. Prabhat Samant Ray, M.P. offered felicitations. At the outset he thanked MPEDA for conducting the programme in Bhubaneshwar. He said that Orissa contributed around Rs.500 crores annually in foreign exchange through exports of marine products. He express- ed unhappiness at some of the conditions imposed by the Govt. of India for stepping up marine fishing, which hindered the growth of the seafood industry. He cited the example of the recent ban on catching 56 species, which he felt was difficult to implement in prac-

tice. He concluded by stressing the need for doubling marine products exports from the present Rs.6,000 crores to Rs.12,000 crores.

The Union Minister of State for Commerce and Industry referred to the role played by MPEDA, as key facilitator of export of marine products from India since 1972. He said the MPEDA played a major role for the growth of marine products exports by way of market diversification. He said that the major markets for Indian marine products were Japan, USA, EU and several South East Asian countries and China.

He also mentioned that marine products were one of the 33 thrust items identified by the Govt. of India for increasing exports. Speaking of India's exports he described that they were miniscule in proportion to the world trade and stressed the need for a major increase in India's share.

A book entitled 'Handbook on Aquaculture' was released by the Minister.

MPEDA's awards for the year 2000-'01 were then presented by Mr. Rajiv Pratap Rudy, Union Minister of State for Commerce and Industry to various awardees. He congratulated them for their achievements and for getting the Awards.

(While *Fishing Chimes* has been able to secure the pictures of most of those who received the awards (printed hereunder) the pictures of the following awardees could not be secured for inclusion as part of this write-up. 1) Award for the second highest performance in the export of Frozen Cephalopods - Category II (B) ~ Awardee :Abad Fisheries 2) i) Award for the Highest performance in the export of Fozen finfish - Category II (C) ~ ii) Award for the highest performance in the export of Chilled Marine Products - Category II (D) ~Awardee : Excel Ice Services ~ 3) Award for the second highest performance in the export of Chilled Marine Products Category II (D) ~ Awardee : Chand International ~ 4) Award for the highest performance in Deep Sea Fishing - Category V ~ Awardee : Dragon Fisheries Ltd.)

The function came to a close with a vote of thanks by Mr. Tara Patnaik, Managing Director, Falcon Marine Exports, Ltd, Bhubaneswar.

Presentation of MPEDA's Awards 2000-'01 by Rajiv Pratap Rudy, Union Minister of State, Ministry of Commerce & Industry

Category I : Highest performance in overall exports Category VI A : Highest performance in the export of value-added products; *Recipient* : Mr. Shivaram. K. Warrior, Business Manager, M/s. Hindustan Liver Ltd.

Category II (A) : Highest performance in the export of Frozen Shrimps
***Recipient* : Mr. Tara Patnaik, Chairman, M/s. Falcon Marine Exports Ltd.**

Category II (A) : Second highest performance in the export of Frozen Shrimp

***Recipient* : Mr. A. Sreeram, Executive Director, M/s. Nekkanti Seafoods Ltd.**

Category I : Second highest performance in overall exports; Category II (C) : Highest performance in the export of Frozen finfish; *Recipient* : Mr. B.N. Linga Reddy, Director, Castlerock Fisheries Ltd.

Category II (E) : Second highest performance in the export of Dried Marine Products; *Recipient* : Mr. Sudhir Ranjan Das, M.D., M/s. B.S. Seafoods Pvt Ltd.

Category III : Highest performance in the export of Live Marine Products; Recipient : Mr. K. Sekar, Chief Executive, M/s. Madras Seafoods.

Category III : Second highest performance in the export of Live Marine Products; Recipient : Mr. Ravi Shankar, Manager, M/s. Scanet Exports Ltd.

CATEGORY V Second highest performance in Deep Sea Fishing

Recipient Mr. T.Raghu nath Reddy, Managing Director, M/s. Suvarna Rekha Marines Pvt. Ltd.

Category IV : Highest performance in the export of Aquarium fish; Recipient : Mr. Deepak Nopany, Chief Executive Officer, M/s. Asian Exports.

Category IV : Second highest performance in the export of Aquarium fish; Recipient : Mrs. & Mr. Jonathan A Rao, C.E.O., M/s. Pescina Indica.

Category VI (B) : Award for the special efforts; Recipient : Mr. Ram B Panjri, Chief Executive, M/s. Hiravati Exports Pvt. Ltd.

Category II (E) : Award for the highest performance in the export of Dried Marine Products; Recipient : Mr. Shyam Prasad, Manager, M/s. Marinex.

Category II (A) Special Award for the export of Frozen Shrimp

Recipient Mr. A.Abdul Kareem, Chief Executive, M/s. Wellcome Fisheries

Preliminary Observations on the Operation of TED in Bottom Trawl

Paul Kirubakaran, M.Neelakandan, S.Shaji, D.V.Rao, N.Venkateswarlu and C.P.Verghese
Central Institute of Fisheries Nautical & EngineeringTraining, Visakhapatnam Unit, Visakhapatnam - 530 001, A.P.

Turtle finds a place in the list of endangered species under Indian Wild Life (Protection) Act, 1972,apparently for the reason that it is a dwindling species, needing protection and conservation, particularly during shoreward migration for laying eggs. The environmental hazards to which turtle eggs are exposed also required to be removed to enable the eggs to hatch and the babies to swim back to the sea.

Turtles enter into shrimp nets incidentally, forming part of the catch. The United States Public Law enacted by the U.S. Congress in 1989 has made it mandatory for the nations exporting shrimp to United States, to adopt regulations governing the incidental capture of sea turtles, comparable to those of the US and stipulating that the average rate of incidental capture of sea turtles by vessels of exporting countries to be no more than incidental captures of turtles comparable with those by US fishing vessels. The US shrimp import embargo imposed on 1st May, 1996, stipulated that the shrimp trawls should not inflict damages to the sea turtles while in operation. The clear intent of this Law is to encourage nations to adopt regulations requiring use of Turtle Excluder Device (TED) in all shrimp trawlers fishing in the seas where the sea turtles are known to occur. US imports about 3 million tonnes of headless shrimp, of which India holds the fourth position, contributing 7.2% of its import. For India, U.S. is the largest importer of shrimp next to Japan.

An Expert Scientific Panel was constituted by the Ministry of Agriculture Government of India, to conduct a detailed study on the distribution of sea turtles, their incidental mortalities in fishing nets and use of TED in fishing trawlers. One of the terms of reference of the panel was to conduct trials/demonstrations on the efficacy of the established TED models in the Indian waters and find the loss of catch (%) through the use of TEDs in the trawl nets.

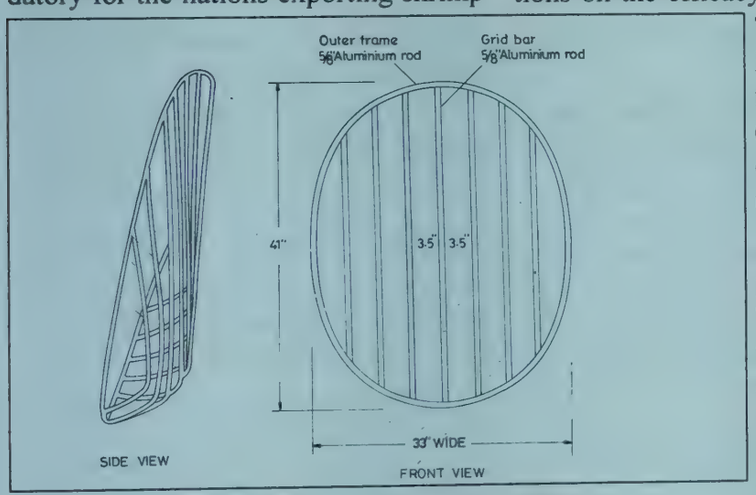


Fig 1. Super Shooter TED

Accordingly, a programme of using TED on trawl net was chalked out for experimentation on board MV Skipper-III (28.19 m. OAL with 600 BHP). This programme was aimed at finding out i) Percentage of escape of fish and prawn, ii) Suitability of TED for exclusion of turtle and iii) Convenience/suitability or otherwise of operating TED onboard other commercial trawlers. Out of TED designs available, the Super Shooter-Georgia type was selected for the experimentation.

Methodology

A super shooter type TED, a single oval frame, measuring 41" in height and 33" in width (Mitchell *et al*,1995) was constructed. The rig and grid base are constructed of 5/8" solid aluminium rod. The 7 nos. of grid bars are welded to the inside of the frame 3 1/2" apart with each bar having a 45° bend just above the bottom of TED frame to help keep the device free from debris (Fig.1). The TED was locally fabricated at a cost of Rs.2,000/-.

MV Skipper III, an outrigger shrimp trawler and reverted to undertake stern trawling operations, was utilised to test the super shooter type TED (proposed to be operated on the same vessel after the present experiment in the outrigger Quadrig configuration). It was rigged to a 31.8m Box/Shrimp stern trawl after modifying the throat portion of the net. The design of the net with the TED is given in fig.2.

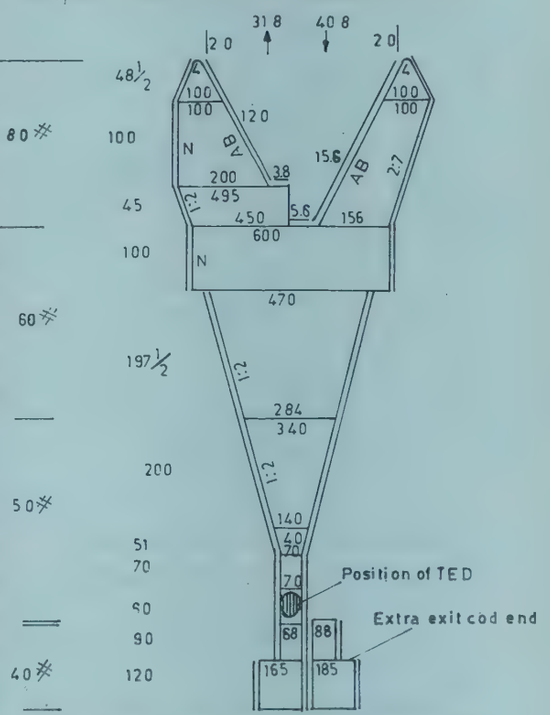


Fig 2. Box/Shrimp Trawl-TED Attachment

While mounting the TED frame to the throat, an exit hole is provided. An extra exit cod end is provided to collect the fishes that could escape through the exit

hole. The details of the rigging of the TED are as under:

Trawl extension in the throat: The trawl extension was made from a single piece of 50mm stretched mesh length netting of 2mm dia. HDPE twine. The netting was of 140 meshes in 'T' direction and 60 meshes in 'N' direction. The netting was made into a tube by seaming the sides together.

Grid Angle: The TED was inserted into the tube of the extension and the extension seam was positioned along the top. Starting at the leading edge of the extension, 18 meshes along the seam were counted and the top centre of the frame was attached to the webbing. In order to find the bottom centre attachment point for the frame, 34 meshes along the top seam from the leading edge of the extension was counted and from that mesh, 70 meshes perpendicular to the seam, were counted and at this point the bottom centre of the frame was attached. The sides of the device were then sewn evenly from the top attachment point to the bottom attachment point and this rigging provided the desired grid angle between 50°-55°.

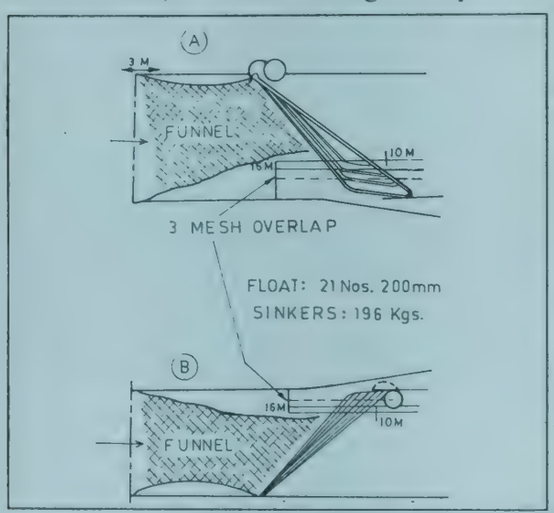


Fig 3.TED in Operation Ⓐ Lower Exit & Ⓑ Upper Exit

Exit Hole: Half mesh was cut in front of the bottom centre of the frame for a distance of about 28". The cut edge was squared to 47 meshes straight from one end of the cut to the opposite end and forwarded by 15 meshes, thereby resulting in a rectangular opening in the extension piece of 47 meshes X 15 meshes.

Construction of funnel: The rectangular piece was then cut to the size of 93 meshes x 29 1/2 meshes of the webbing having 50mm stretched mesh length of 2 mm dia HDPE twine and funnel from the piece was made by seaming the 'N' side together.

From the leading edge of the funnel 21 meshes down the seam was counted and from that point 19 meshes were evenly cut to the left and 19 meshes to the right. At the end of the cut on each side of the seam a taper of 2 meshes : 2 bar was made.

The funnel was then installed inside the extension forward of the TED by matching the seam of the funnel with the seam at the top of the extension. The funnel was sewn to the third row of meshes behind the leading edge of the extension. The 93 meshes funnel was then attached to the piece. 140 meshes of the extension piece and the tapered end of the funnel was secured to the grid bar by attaching the top centre mesh of the funnel to the centre grid bar and the bottom of the funnel was let loose without attaching to the grid bar.

Attachment of the exit hole cover: The exit hole cover was made in the same size of netting with 53 x 36 meshes and the 53 meshes were attached to 47 meshes of the opening by overlapping 3 meshes of the flap on each side. The side of the flap was attached to the side of the opening by seaming 16 meshes of the flap to 15 meshes of the opening ahead of the TED frame and 10 meshes of the flap behind the TED frame was left free into the exit cod end of 176 meshes circumference and 90 meshes depth of 40 mm stretched mesh length. The exit cod end and the normal cod end were of same size and specifications are as given in figure 2.

Operation: The experiment on board vessel M.V.Skipper-III commenced on October 13, 1999 and the vessel conducted fishing in the areas of 17° 37' N to 17° 55' N latitude and 83° 22' to 83° 48' E longitude in the depth range of 36-50mt. Due to the constraints in operation against the current, the trawling operations were carried out with the current astern. Of the total 44 hauls, 14 hauls were made with the exit hole at the lower end and 30 hauls were made with the exit hole shifted to the upper end of the net and data pertaining to the quantitative and qualitative analysis of the catch in both normal and exit cod ends were collected and escapement % was analysed.

A total of 73 fishing hours were expended, of which 19.25 hours were spent on fishing with the lower exit (Fig 3A) and 53.35 hours were spent on fishing with the upper exit (Fig 3B) and the performance of the TED with trawl dragged along the current could only be observed.

Result

A total catch of 1,884 kg was recorded with the lower exit operation resulting in 818.7 kg in the exit cod end with escapment of 43.4%. Though capture of two numbers of turtles was reported during November, 1999, both were found in the exit cod end and no turtle was found in normal cod end. The species-wise escapement for the 14 hauls are as follows: a) Prawns :35.3%, b) Cephalopods:52.5%, c) Pelagic Fishes:50.6%, d) Demersal fishes:40.7% and e) Trash fishes:83.6%.

The pelagic fishes comprised Pomfret, Seer fish, Perch, Barracuda, Mackerel, Horse Mackerel, Carangids, Elocate, Sardines, Anchovies, Indian Drift fish and Cat fish. Demersal fishes comprised Ribbon fishes, Nemipterids, Silver belly, Sciaenids, Upenoids, Lizard fishes, Priacanthus and Sole fishes.

As the escapement was observed to be on the higher side with exit on the lower panel, the exit was shifted to the upper panel during December, 1999. Of the total 30 hauls with the upper exit, a total of 4,030.5 kg was caught of which 551.35 kg were recorded in the exit cod end with an average escapement of 13.7%. Though 13 nos. of turtles were caught during December 1999 and January 2000 in the exit cod end, no turtle was found in the normal cod end. The species-wise escapement percentages for the 30 hauls were as follows:

a) Prawns:0.5%, b) Cephalopods:8.4%, c) Pelagic Fishes:43.3%, d) Demersal fishes:23.9% and e) Trash fishes:11.3%.

Pelagic fishes comprised Pomfret,

Seer fish, Perch, Barracuda, Mackerel, Horse Mackerel, Carangids, *indian Drift fish*, Lactarius, Elocate, Sardines and Cat fish were observed to have an escapement of 43.3% which was very high. The escapement of Elasmobranchs was observed to be 50-100% depending on the size of the fish. Demersal fishes comprised Ribbon fish, Silver belly, Jew fish, Sciaenids, Nemipterids, Upenoides, Priacanthus, Lizard fish and Sole fish and these were observed to have an escapement of 23.9%.

All the total 13 nos. of turtles which were caught weighed 460 kg. After collecting the morphometric measurements, the same were released back alive to the sea. The morphometric measurements such as weight of the turtles, carapace length, carapace breadth, total length and head length were recorded. All the turtles had the following characteristics resembling the characters of the Chelonidae family.

Colour: Dorsal side is dark green and Ventral side is light green.

Scutes: The Scutes were found to be juxtaposed and non-overlapping. Four pairs of lateral scutes were on the Carapace.

Flipper: Single claw was present on each of the flippers.

Cost Analysis of Escapement

A preliminary study of the economics of trawl operation with TED was attempted. The fish purchase rates offered by tenderer of the Integrated Fisheries Project for the year 1999-2000 were adopted and the unit price for the catches in the regular and exit cod ends were calculated for both the types of configurations with the exit on the lower panel and the other on the upper lanel.

So far as the exit on the lower panel is concerned, the average escapement percentage was 43.4% comprising fishes, cephalopods, and crustaceans. The unit price for the fishes from the regular cod end was Rs.5.47 and for these from the exit cod end was Rs.5.02. The unit price for the demersal and pelagic fishes were later computed separately. The groups were broadly formulated taking into consideration the habitat and consumer demand and the value of the fishes. The unit price of the demersal group of fishes in the regular cod end was Rs.3.30 and that of the exit cod end was Rs.3.40. The unit price for the pelagic group of fishes in the regular cod end was Rs.15.40 and that of the exit cod end was Rs. 13.40.

Regarding the exit on the upper panel, the average escapement percentage was 13.7% comprising all the fishes, cephalopods and crustceans. The unit price of the regular cod end was Rs.4.40 and that of exit cod end was Rs. 6.20. The catch was grouped broadly into two categories, 1) Demersal and (2) Pelagic taking into consideration the habitat, the consumer demand and the value of the fishes. The unit price of the demersal group of fishes in the regular cod end was Rs.2.90 and that of in the exit cod end was Rs. 2.80. The unit price of the pelagic group of fishes in the regular cod end was Rs. 9.96 and that of the exit cod end was Rs. 14.32.

Discussion: From the results of the experiments it is noted that the super shooter type TED used in the programme was effective in excluding the turtles as bycatch of the trawl, irrespective of the positioning of the exit whether in the lower panel or in the upper panel.

The experiments were conducted from October 1999 to February 2000, the period in which the report of turtle movements towards the east coast has been recorded. However, results of round the year operation are necessary to arrive at the conclusion whether TED operation can be seasonal.

The shifting of the exit from the lower panel to the upper panel brought considerable decrease in the escapement percentage of fishes. The escapement of prawns and cephalopods was observed to be of 0.5% and 8.4% respectively and that of fishes were found to be 11.3% to 43.3% respectively. The large sized fishes and fishes with appendages such as catfish were observed to be in the exit cod end which has created an upward rise in the escapement.

Though the use of TED has been proven to be 100% effective in excluding the turtles from the bycatches, the loss of the catch comprising shellfish, cephalopods and fishes has also to be taken note of. The unit price worked out for the two different categories/groups of fishes signified the fact that though the percentage of escapement has been low with the exit on the upper panel, the unit price of these escaped fishes works out to Rs. 14.32 for the pelagic fishes which include majority of the table fishes. Though these fishes are the bycatch of the shrimpers, with the depleting trend of shrimp catches, in the present scenario of fishing in the upper east coast, fishermen are forced to meet part of the operational expenditure through earnings from the marketing of these bycatches. The higher unit price of the exit cod end reveals: a) The percentage of escapement has got a direct bearing on the unit price of catches and on the gross returns of operation of trawl nets; b) Higher the unit price, greater is the loss of revenue; and c) The unit price of the demersal group of fishes of the regular and exit cod end is same at Rs.2.90, whereas the escapement of catch is 14% and this escapement does not upset the economics, as the impact of escapement percentage is minimum. On the other hand, in the case of pelagic group of fishes the average escapement of catch is 19% and the difference of unit price of the regular cod end and exit cod end is Rs. 4.36. As this escapement cannot be avoided, the higher unit price of the exit cod end adversely affects the economics.

Turtles, which are an endangered species under Indian Wild Life (Protection) Act, 1972, can be saved from the incidental mortality caused by trawling, through the installation of super shooter type TEDs. Nevertheless the operational economics of these trawlers are bound to be affected and at the same time landings of the bycatch fishes are likely to be reduced. However, the need for environmental protection is important for maintaining the stability and equilibrium of the marine eco system.

Reference

MITCHELL, JOHN F.JOHN, W.WATSON, DANIEL G.FOSTER, ROBERT E. CAYLOR (1995). The Turtle Excluder Device (TED): A Guide to Better Performance. *NOAA Technical memorandum NMFS-SEFSC-366*, 35p.

AWARNESS-CUM-TRAINING PROGRAMME ON SCAMPI FARMING

Beechpally, Mahaboobnagar Dt., A.P. : 17 to 19 Jan, 2002

The captioned programme was conducted by the Kakinada centre of Central Institute of Fisheries Education, Mumbai at Beechpally, near Gadwal (Mahaboob- nagar Dist., A.P.) from 17to 19 January, 2002 in association with Department of Fisheries, Government of Andhra Pradesh. Being first of its kind in Telangana region of Andhra Pradesh, the programme had evoked considerable response. About 40 fish farmers including representatives of fishermen's co-operative societies participated in the training programme. With the culture of *Macrobrachium rosenbergii* gaining momentum in the areas adjacent to Krishna and Tungabhadra rivers, about 250-300 acres have been brought under Scampi culture in the district during 2001-2002.

Mr. V.Suresh, Joint Director (Inland), Department of Fisheries, A.P, extended a warm welcome to Dr. S. Ayyappan, Director, Central Institute of Fisheries Educatiion, Mumbai and to all other participants. He expressed the gratitude of the department to Dr. Ayyappan for his participation in the programme being conducted in this backward area, located at a long distance from developed areas.

The "Awareness-cum-training programme" was inaugurated by Dr.S.Ayyappan, Director/Vice-Chancellor of Central Institute of Fisheries Education, (Deemed University), Mumbai on 17 January, 2002. In his address, while lauding the efforts made by Scampi farmers, Ayyappan stressed that management practices were to be scientific and implemented with low stocking densities and with low inputs for sustainable culture. He advised against intensification of efforts to acheive high production. He observed that fish from Andhra Pradesh was reaching not only Howrah market but also several places in Northern India, North Eastern India and also Bangladesh. While pointing out that there was lot of potential for fish culture in small and large reservoirs to augment inland fish production, he had categorically discouraged the culture of catfish (*C.gariepinus*) and *Pangasius sutchi* and urged farmers to promote culture of native species instead. Ayyappan had assured farmers that Central Institute of Fisheries Education would provide all technical support and guidance and attend to the technical enquiries of the farmers at site for solving their problems.

Mr. C.Ilaiah, Additional Director, Fisheries Department (Government of Andhra Pradesh) presided over the function. He said that about 16,000 ha were under Scampi culture as per official records but in Nellore District alone 20,000 ha were under culture. He had informed that nearly 300 acres were under Scampi farming in Telangana region.

Dr. G. Venugopal, Officer-in-charge, CIFE, Kakinada centre and programme coordinator stated that the local fisheries officials and Regional Dy. Director of Fisheries had informed that farmers were not well aware of techniques of Scampi farming and expressed need for a short-term training programmes. The CIFE, Kakinada centre, had designed this three day programme, so that field trips and talks and on farm demonstrations could be taken up simultaneously. Venugopal also said that similar kind of programmes would be taken up in Karimnagar and Nalgonda districts and also in Rayalaseema region. He had informed that a special training manual in Telugu language had been specially brought out for this programme for benefit of farmers.

Mr. B.Vishnu Bhatt, Deputy Director, MPEDA, Vijayawada addressed the participants. He said that Scampi farming should be sustainable for long and cautioned against use of chemicals, antibiotics etc. He spoke on the export market potential, status of scampi farming in the country. He mentioned that MPEDA would extend subsidy of Rs.30,000/- per ha and to a maximum of Rs.1,50,000/- for a five hectare farm.

Mr. V.Narayana Rao, District Revenue Officer, released the "Training Manual", a Telugu publication brought out by CIFE, Kakinada centre, to mark this "Awareness-cum-training programme".

On the second day of training programme field visits were arranged. On-farm demonstrations in the villages of Beechpally, Shanthinagar, Ashoknagar, Tummala etc., were conducted. Venugopal spoke on site selection, and on design of pond and Monk type sluice for effective draining of bottom water. He demonstrated pond management practices, grading of prawns into different sizes, segregation of males and females, identification of morphotypes and their management to improve the pond yields. Mr. P.Srinivasa Rao, Technical Officer, demonstrated the identification of sexes. and screening of prawns for health management. Mr. V. Narasimhacharyulu demonstrated the pond water quality management methods. Mr.R. Ravisankar Patnaik has briefed about methods of nursery rearing of post larvae and advantages of juvenile stocking.

On the third day, presentations were made on various aspects of Scampi farming including polyculture techniques, disease management and control methods. Mr.Sudarshanam, Dy.Director, APCOB, narrated the success stories of Scampi farms of Nellore. Mr.B.Vijay Kumar, AGM. NABARD, and Mr. Vidyasagar Rao, Branch Manager, Andhra Bank, explained the role financial institutions can play for promoting Scampi farming. V.Suresh, distributed the certificates. issued by CIFE, Mumbai, to all the registered participants of the programme during valedictory function. At the end of the awareness-cum-training programme, Mr. B. Surya Prakash Rao, Regional Deputy Director (Zone-VI) proposed a vote of thanks.

Madhya Pradesh Newsletter

From R.P. Tuli

Fish and Fish seed Production (2000-2001)

With the separation of Chattisgarh State in Nov. 2000, the present Madhya Pradesh has 3.05 sq km of area, about 69% of its earlier geographical area of 4.43 lakh sq.km. It has attained eighth position in fish production and fourth position in fish seed production in the country. Madhya Pradesh's share was 4.52% out the national inland fish production of 28.227 lakh tons (1999-2000). Now Madhya Pradesh is left with 0.59 lakh ha of pond area of which about 58.6 % has been brought under culture. In case of reservoirs, 2.25 lakh ha of area is available, out of which about 90% is reported to have been brought under fishery development.

During 2000-2001, 0.49 lakh of fish and 339.71 million nos of fish seeds were produced in the State, showing slight decrease (1.67 %) in fish production and increase in fish seed production over the status in 1999-2000. Combined production of fish from MP and Chhittisgarh is reported to be 1.45 lakh t which was about 14.18% higher than the previous year.

About 40% of area of MP received rainfall below normal during two successive years, which adversely affected fish production. There is need to critically review fish production and productivity of all districts of MP in relation to status of rainfall in the year 1999-2000,2000-2001,and 2001-2002. This is particularly necessary as the present situation is alarming. There is an urgent need to evolve remedial measures by way of package of practices, in the light of a review to be undertaken.

Reservoir Development Project

Central Government has sanctioned a project worth Rs. 19.16 lakhs for the development of small reservoir fisheries of M.P. Four reservoirs have been identified for this project. The details are as follows.

District	Name	Area	Year of Construction	Existing Productivity
Indore	Yeshwant Sagar	395 ha	1950	25.26 kg/ha
Dewas	Chandrakeshar	307 ha	1980	7 kg/ha
Raisen	Dahod	460 ha	1958	36 kg/ha
Jabalpur	Boribund	650 ha	1988	18.62 kg/ha

The project aims at scientific production of large size fingerlings (100-125 mm length) in the reservoir itself, by setting up "Pen" or floating cages where infrastructure for setting up these is not available. A small fish seed farm is available at Dahod and one is under construction at Chandrakeshar. The other two reservoirs have no fish seed farms.

Matsya Mahasangh

State level Mahasangh has lately found its new executive head., Mrs., Kalpana Srivastava, an IAS officer of 1992 batch who has joined as Managing Director from Nov. 2001. She intends to inject lot of dynamism into the activities of Mahasangh. Her predecessors were Mrs. Aruna Sharma of 1982 batch and Mrs. Gauri Singh of 1987 batch.

Banasagar

This reservoir has been constructed in district Shadol on river Sone, a tributary of Mahanadi. It has been transferred to Mahasangh in 2000-2001. Stocking was initiated last year and it is learnt that, lately, commercial fishing has been also initiated. In the past, fisheries department has carried on some pre-impoundment studies. Some of the details are given below:

Water Quality (1987)

pH	7.3 to 8.83
Total Alkalinity	168 to 208 mg/l
Specific conductivity	445 to 490 µ mhos
Phosphates (P)	Traces to 0.04 mg/l

Above data indicate medium level of production potential (Jhingaran,1990) of the reservoir. Water quality studies need to be continued in the post-impoundment period and the studies should include micro flora, fauna and benthos.

Fish Composition

Some data about status of important fish have been collected earlier. Fisheries department in 1991-'92 and 1992-'93 examined 423 kg of fish. According to a published report, major carps comprised 33.09 % in fish landings. The details are given in the Table hereunder.

Catla catla	8.98%	*Wallago attu*	13.02%
Labeo rohita	11.11%	*Ompak bimaculatus*	2.6 %
Cirrhinus mrigala	13.00%	*Mystus* spp.	6.62%
Labeo calbasu	6.38%	Others	38.29%

Since commercial fishing has commenced, detailed record of carp and non-carp fish landings needs to be maintained and regularly monitored. Preferably, no *Catla* below 4 kg size should be caught. According to Jhingaran and Natarajan (1963) catch below 4 kg weight is generally of less than 3-year age group, which needs to be protected.

Renewal of Lease of Tawa Reservoir

Fishery lease of Tawa has been renewed for 5 years from 24 December 2001 in favour of Tawa Reservoir Displaced Persons Cooperative Federation. However, some earlier concessions have been withdrawn and restrictions placed on the appointment of advisors.

Withdrawal of concessions on shrinkage allowance during weighing, including total production for charging royalty at flat rate of Rs. 6/- per kg, is bound to depress profit margin of the federation by about 9%. Appointment of Chief Executive Officer/Managing Director of federation as per government-laid qualification is going to escalate expenditure with

regard to salaries and allowance by about Rs. 2 lakhs per year. As per available information an average expenditure under this head during last four years was Rs. 2.01 per kg of fish caught from the reservoir. In future at an average annual estimated fish production of 350 t, expenditure on this account may increase by about 56 %.

In view of likely negative impact of new conditions on federation's future financial status, considering the development needs and prosperity of fishermen, the restrictive conditions imposed while granting the lease need a closer look. Production and marketing are key areas, which if properly addressed, can lead to profitability as in the past. Few suggestions for consideration in this context are:

Fish Production: i) Greater use of seine nets and separate monitoring of its catches, quantity and quality wise should be undertaken. This may increase production of Mrigal and local major groups of fish. Existing average share of Mrigal in fish production is 12.6% and that of local majors 10.63%. ii) Complete prohibition on catching of fish of 2-3 kg wt. size may adversely affect overall production of fish by about 28%. But there shall be multiplier effect in future production of catla. iii) Greater production of Rohu can be achieved by preferably using more gill nets of 60 mm (bar) mesh. At present, average share of Rohu in fish production is only 2.13 % while its stocking density is 4% more than that of Mrigal. Hence, there is scope for increasing production of Rohu.

Fish Marketing: i) Catla of 5 kg and above alone should be exported to Howrah market, ii) Outside sale be preferably limited to Bhopal and Delhi where better prices were received during year 2000-2001, and iii) Local sales be increased by taking into consideration the size and variety of fish preferred by the consumer and seasonality of demand.

Recent Trends in Gandhi Sagar Fish Production

After record production of 3,424.339 tonnes in 1994-'95, 2,000 t of annual production mark was achieved only twice, in 1995-'96 and 1998-'99. Data of last 10 years production are given as follows.

Year	Production	Year	Production
1991-92	679.247	1996-97	1393.703
1992-93	406.014	1997-98	1824.722
1993-94	880.604	1998-99	2054.960
1994-95	3424.339	1999-'00	1881.048
1995-96	2986.511	2000-'01	1226.450

Available trends indicate that production may not improve in the year 2001-'02, as waterspread of Gandhisagar has shrunk to about 28% of its designed full reservoir area of 6,600 ha due to lower monsoon rainfall in year 2001. Similar situation was witnessed in the past during 1981-'82 when production was low. It may be recalled that since 1992-'93 stocking has been never less than 100 fingerlings per ha in which percentage of Catla seed was 33 % or more. Hence, there is need to identify factors which may be responsible for negative influence on fish production when water impoundment is adversely affected by insufficient rainfall.

Breeding of Jayanti in Madhya Pradesh

It is learnt that in year 2001 Fisheries Department has successfully bred Jayanti (selectively bred Rohu) at Jamunia fish seed farm. This fish is reported to have 40% greater growth potential. It shall be advisable for the fisheries department to expand its seed production so that fish farmers could avail of benefits of Jayanti.

Breeding of *Tor tor* : Madhya Pradesh Council of Science and Technology has taken up an ICAR supported three years project for the development of Mahseer in river Narmada. According to available information breeding of *Tor tor* has been successfully carried out for the first time in Madhya Pradesh at Powarkheda Fish Seed Farm (Hoshangabad) during year 2001 and 2002. Brooders for the work were procured from river Narmada itself.

Some spawn of *Tor putitora* and *Tor khudree* has been also procured from Lonavla (Maharashtra). After raising spawn to fingerling stage, they have been tagged and released into river Narmada near Hoshangabad. In order to maintain genetic purity of Mahseer stock of Narmada river, some specialists advise that hatchery-bred stock from outside Madhya Pradesh may not be introduced in the river network of the State. Dr. S.D. Tripathi, former Director of CIFE, has echoed a similar concern on such introductions during a recent Workshop on Mahseer held in August 2001 at Mumbai.

Training Programme on 'Quality control of Fish and Fishery Products'

The captioned National Level Training Programme is scheduled to be conducted by Department of Fish Processing Technology, at its Shore Laboratoray Campus of Fisheries College and Research Institute, Tamilnadu Veterinary and Animal Sciences University, Thoothukkudi, Tamilnadu from 13 May to 17 May 2002. The training programme will cover quality assurance aspects including Hazard Analysis Critical Control Point (HACCP), Standard Sanitary Operating Procedures (SSOP), ISO 9000 standards, European Union (EU) hygienic regulations, National Standards and Microbial and Biochemical quality evalution of fish and fishery products.

The training (approved by TANUVAS) will be very much useful to fish quality control technologists, researchers, fisheries entrepreneurs, teaching staff and other concerned. The registration fee for the training programme is Rs. 1,500/-. For further details contact Dr.V.Sundara Raj, Dean, Fisheries College and Research Institute, Thoothukkudi - 628008.

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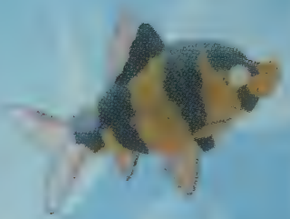

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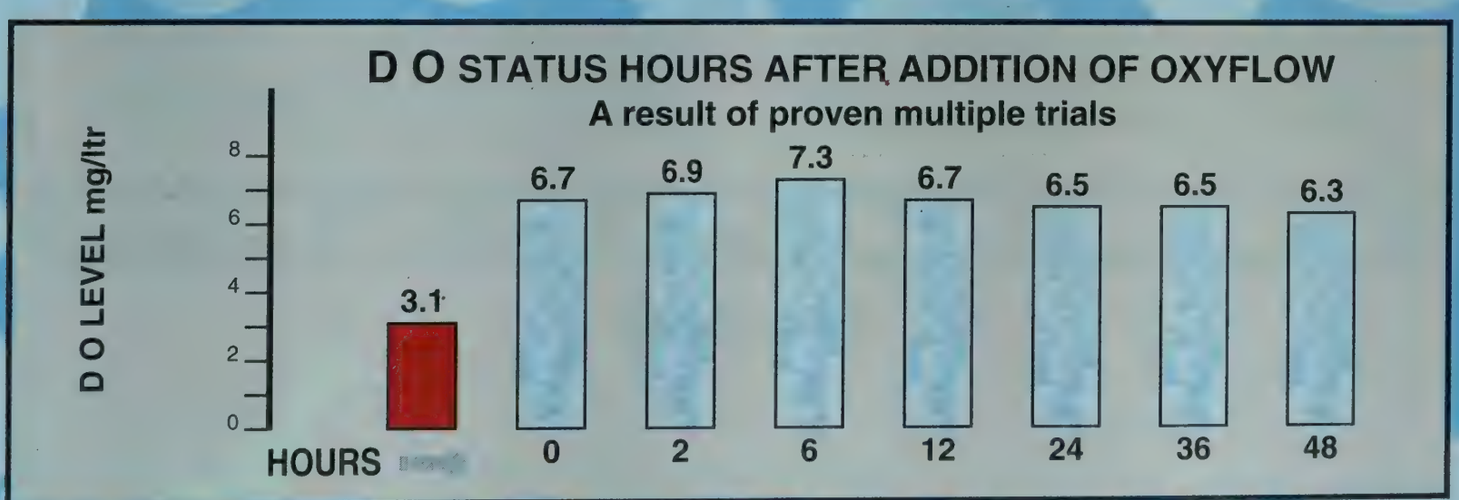

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The State of World Fisheries

Reported global production of marine capture fisheries has increased from 17 mt in 1950 to about 80 mt in the mid-1980s, oscillating since then between 78-86 mt (excluding discards), representing 67-84% of the overall fisheries production including aquaculture. The annual rate of increase of marine catches decreased to almost zero in the 1990s, indicating that, in average, the world oceans have reached their maximal production under the present fishing regime. However, this situation shields important changes in the species composition of world fish catches: the proportion of low value species has increased substantially since the 1970s while the proportion of the traditional target resources, as well as average sizes, have gone down. These realities indicate that current production may not be sustainable under present circumstances.

Resources : The data available till 1999 for the 16 FAO statistical regions of the world's oceans indicate that four of them (25%) are at their maximim historical level of production, eight (50%) are slightly below it and four (25%) are well below it. In most areas, overfishing is certainly a significant factor responsible for the declines. The same data show that, among the close to 600 "stocks" or groups of resources for which FAO has obtained information, about a quarter of the resources could perhaps produce more, more than a quarter are overxploited and need rebuilding and a little less than half are exploited close to their maximum level of productivity. These global figures reflect evident shortcomings in the management of many fisheries resources to maintain them at their highest productive level. Altogether, the information available tends to confirm the estimates made by FAO in the early seventies that the global potential for marine fisheries is about 100 million t of which only 80 million t were probably achievable for practical reasons. It also confirms that despite local differences, overall, this limit has been reached.

Fishing fleet : There are no totally reliable or comprehensive data on global fishing power or even of fleet size, and data for small-scale fisheries are scanty. The FAO analysis based on the Lloyds Register and its own databases indicates that the global fishing fleet increased rapidly between the 1950s and the 1990s through the fleets extending their operating range (from 1950 to 1970) and adoption of new technologies. During the last decade, the fishing power of individual vessels has continued to grow through a range of technological advances, not the least ever more advanced and more economic electronic fish finders. Yet these advances in technology should not be viewed in a negative light, rather that they make more demands for effective fisheries management. During the last few years, the number of fishing vessels has tended to decrease in developed countries and to increase in some developing ones.

Fishers : Employment in the primary capture fisheries and aquaculture production sectors in 1998 is estimated to have been about 36 million people, comprising about 15 million full-time, 13 million part-time and 8 million occasional workers of which it is estimated that about 60% are employed in marine fisheries. For the first time since the early 1970s, there is an indication that growth in employment in the primary sectors of fisheries and aquaculture may be slowing down significantly.

Technology : The effectiveness of fishing gears for catching fish has evolved rapidly since the early 50s. Yet, fishing gear has become more environmentally friendly, e.g., by becoming more selective. Safety on-board fishing vessels has also improved, although fishing remains one of the most dangerous kind of employment with more than 25,000 fatalities per year. Advances in technology have also made fish processing and fish preservation more effective than ever, making high quality products more prominent than ever on the international markets. It could be argued that advances in technology, not the least in telecommunications, could make implementation of ecosystem based fishery management (EBFM) to materialise.

Fish trade : Fish has become the most internationally traded food, as some 37% (by quantity) of all fish for human consumption is traded across borders. Developing countries now provide some 50% of the fish in international trade, and their net foreign curency income from fish exports rose to some US$ 16 million in 1999. Improvements in logistics, not the least in air freight, is making it practically possible to bring fish from the most remote corners of the world to the international market. Coupled with rising demand and higher prices than ever, the market pull exerts pressure on the resources unless effective fisheries management is enforced. International trade rules can be conducive to sustainable fisheries or they can undermine the resource management. The recent international trade negotiations have shown that there is a strong link between trade and sustainable resource use as manifested in the various environmentally linked issues entering the trade negotiations such as subsidies and overcapacity.

Contribution to food security : The ecosystems of oceans contribute substantially to human food security through direct use as human food and through reduction to meal and oil for animal feed. The reported production for direct human consumption practically doubled between 1950 and 1970, and has tended to stabilize since then at an average of 9 to 10 kg of fish per capita and year, notwithstanding world population growth. However, the proportion of production used directly for human food has declined from about 80% in the 1950s to about 65% since the early 1970s due to the

rapid expansion of reduction fisheries particularly in South America. As total marine capture production is probably close to its maximum while world population growth continues, the per capita supply from marine capture fisheries is likely to decrease, unless more effective management of capture fisheries and further development of aquaculture can increase production.

Food safety : While fish has become recognized as a particularly healthy food, there are concerns for fish quality. Contamination from harmful algal blooms (generated by eutrophication and pollution), as well as pathogens (from untreated sewage), oil spills, heavy metals, PCBs, and dioxin is becoming more widely known.

Fisheries and the ecosystem

Ecosystem characteristics: The marine ecosystem is highly productive and successfully used by humans as a source of recreating, food, pharmaceuticals and livelihood in general. These uses impact on the ecosystem and forecasting and controlling the fisheries impacts in one of the key tasks of science-based fisheries management. This task is greatly complicated by uncertainties arising from difficulties in observing and measuring ecosystem components and properties and by the enormous natural variability, at a range of time-scales, in inter alia the distribution, age and species composition, and abundance of fisheries resources. On a longer time-scale, the ecosystem is affected by global climate change which will probably affect many aspects of fish distribution and dynamics. The marine ecosystem is also significantly impacted by pollution and other degradations, which are usually beyond the control of fishery authorities. Responsible fisheries management requires recognizing these various impacts and adjusting to them, taking remedial steps where necessary if the production of ecosystems is to be maintained.

State of the ecosystem: Little attention has been focused in the past on evaluating the status of marine ecosystems as a whole and there is little information on this. In general, marine ecosystems are less perturbed and damaged than inland and terrestrial ecosystems. However, human impacts are still very noticeable, particularly in the coastal areas, and impacts have been noted nearly everywhere, from the Arctic to the Antarctic oceans and extending to the open ocean. Pollution is important, reaching the oceans through rivers, aquifers, sewage (point sources), drainage (non-point sources) and the atmosphere (wind and rain). GESAMP, the IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, has produced a global assessment (GESAMP, 2001) indicating that, aside from overfishing, the ecosystem is affected by:

- alteration and destruction of coastal habitats and ecosystems: coral reefs, mangroves, wetlands;
- industrial pollution e.g. persistent pollutants (POPs), heavy metals, hormone-disrupting substances;
- sewage pollution leading to contamination of seafood (e.g. cholera, typhoid);
- pollution by nutrients notably fertilizers leading to widespread and increased eutrophication, contributing to destruction of seagrass beds and toxin-producing algal blooms;
- changes (increase or decrease) in sediment flows due to deforestation, bad cultural practices, public works, etc.;
- global warming (see above); and
- the direct impact of fishing on the environment.

Impacts on fisheries: The impacts of land-based and coastal alterations on the marine ecosystem affect the livelihoods of coastal fishing communities and industries and the food security of the poorest ones. They lead to loss of economic opportunities and compound the effects of unsustainable fishery development strategies. Those of direct relevance to fisheries include the following:

- Reduction of the maximum sustainable yield expected from a resource, resulting from the alteration, obliteration or destruction of habitats critical to various stages in the life histories of fishes.
- Modification of the resource species composition, health and diversity. Alterations in the environment lead to genetic selection of the most resilient species, which are commonly those of lower market value and some pollutants modify essential biological processes. Introduction of alien invasive species through ballast waters of trans-oceanic vessels is becoming a serious problem in many areas.
- Increase in ecosystem instability and variability.
- Reduction of seafood quality and safety as discussed above.

Impacts of fisheries on ecosystems are sometimes difficult to separate from environmental effects but have nevetheless been repeatedly stressed. They are widespread and include direct impacts of overfishing, modifying community species composition and genetic diversity through selective targeting of species and particular size classes; impacts on non-target species through low selectivity of certain gears' incidental mortality from lost or abandoned gear, direct impact on the sea bed through e.g. trawls and dredges; and destructive illegal "fishing gear" such as dynamite and poisoning. Discarding of about 20 million tonnes of unwanted fish represents wastage of potentially valuable resources. Progress has been made in addressing some of these, for example through development of more selective gear and more effective zoning practices including the use of marine protected areas. However, the net effect is still frequently inadequate, and frustrated by problems such as open access and excess fishing capacity.

Value of the Ecosystem: The real total value of ecosystem and the relative contribution of the different sectors using it are usually not appreciated but there are some estimates which would indicate that the global value of the goods and services provided by marine and coastal ecosystems is roughly double the value of goods

and services provided by terrestrial ecosystems and comparable to the level of Global GDP. In recognition of their enormous contribution, there is a growing pressure from society for giving the maintenance of the ecosystem an adequate weight in the decision-making process. Failing to do so puts at stake the human welfare derived from these systems.

State of governance

There is no complete global inventory of fisheries management systems and approaches, by countries, stocks or fisheries. At national level, while most countries have in place some form of licensing scheme, they often experience great difficulties in effectively containing an expansion of harvesting capacities. In several countries, access to marine fisheries resources continues to remain unrestricted. However, an increasing number of countries are effectively managing their fisheries and make available the necessary inputs to do so. More recently, there is an increasing interest in rights-based fisheries management including individual, company or community held quotas (IQs), both transferable or non-transferable. Several of the over thirty regional fishery bodies (RFOs) implement policies based on Total Allowable Catch (TAC) and national quotas. At all levels, these approaches are complemented by a series of technical measures to regulate vessels (e.g.,power, size); gear (e.g., size, mesh size); area fished (e.g., closed areas) and fishing time (e.g., fishing effort ceilings, closed seasons); or catch-characteristics (e.g., minimum landing size, stage of maturity, egg-bearing), etc. A serious constraint in some regions is the inadequate enforcement of and compliance with management measures at both national and regional levels.

Fishery management performance.is definitely improving for many fisheries but in far too many cases it is inadquate or even poor. A principal weakness of current management is its widespread reliance on blocking the growth in fishing capacity and effort rather than altering the incentive structure through a rights-based approach that encourages fishers to minimize harvesting capacities and costs and confers stewardship in the protection and conservaton of fishery resources and fish habitats. The many deficiencies often invoked to explain the poor state of many marine fishery resources, such as excess fishing capacity and effort, insufficient selectivity, poor policing and compliance, etc., are largely the direct or indirect consequences of inadequate limited access regimes. Introducing rights-based management, however, raises the thorny issues of resource allocation with the selection of the fishing right holders and deciding on the characteristics of the rights (exclusivity; security; permanence and transferability). These necessary decisions, with significant long-term benefits for the State, the right-holders and the consumer, can have short-term economic and socio-political costs which many politicians find hard to face. The shift to EBFM may not resolve these problems but heighten the urgency for addressing them.

The fisheries management context and framework have greatly improved through a range of initiatives at global, regional and national levels. Overfishing and excess fleet capacities have been generally recognized as worldwide problems (e.g. at UNCED and FAO) calling for socially acceptable and effective solutions. With the coming into force of the 1982 Convention, the fisheries policy framework has become stronger and was re-enforced by the adoption in 1995 of the Code of Conduct for Responsible Fisheries. It will soon be further strengthened by the coming into force of the 1993 FAO Compliance Agreement and the 1995 UN Fish Stocks Agreement. The Code has been complemented with a series of technical guidelines including on fisheries management, on indicators for sustainable development of marine capture fisheries, and on the precautionary approach to capture fisheries and species introductions. Its implementation will also be strengthened by the four International Plans of Action (IPOAs) recently adopted by FAO members: (a) IPOA for the Management of Fishing of Capacity; (b) IPOA for the Conservation and Management of Sharks; (c) IPOA for Reducing Incidental Catch of Seabirds in Longline Fisheries; and (d) IPOA to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. The inherent existence of uncertainty and risk is formally recognized in all modern fisheries agreements as reflected by the implementation of the precautionary approach and the societal quest for more transparency. The broader biodiversity and habitat considerations are being faced and the need to protect the ecosystem is broadly accepted as a fundamental need.

Implementing EBFM

During the last century, fisheries management has always had as its foundations the need to maintain stocks at their highest level of productivity and the principle of rebuilding accidentally depleted stocks. It has also always considered the ecosystem, even if indirectly and generally ineffectively. The United Nations Law of the Sea requires States to ensure that harvested species and species associated with or dependent on harvested species are not over-exploited either in national EEZs (Article 61) or in the high seas (Article 119). The emphasis on ecosystems has been strengthened since the 1992 UNCED Summit. In addition to those international instruments relating to fisheries specifically (see paragraph 26) many others initiatives have been taken calling for more responsible "management of the ecosystem". These include, for example:

- the Global Plan of Action of the Protection of the Marine Environment (GPA), adopted in 1995 to address the fact that 80% of the marine pollution is caused by human activities on land;
- the Convention of Biological Diversity (CBD) which came into force in 1993, including the Jakarta Mandate on Marine and Coastal Bio-diversity (CBD-JM), adopted in 1995, whcih provides a new global consenus on the importance of marine and coastal biological diversity;
- the FAO Commission of Genetic Resources for Food and Agriculture which has broadened its mandate to cover aquatic resources;

- the International Coral Reef Initiative (ICRI), dedicated to reef conservation and management since 1994; and
- the Marine Protected Areas initiative launched by the Global Environment Facility (GEF) and the World Bank, in collaboration with the World Conservation Union's (IUCN), the Commission on National Parks and Protected Areas (CNPPA) and the Great Barrier Reef Marine Park Authority (GBRMPA).

Implicit in all initiatives for management of the ecosystem is recognition that man cannot manage the ecosystem as such, but only the human activities using it. It follows that fisheries authorities on their own do not have the full mandate nor authority for ecosystem management and that a pre-requisite for effective ecosystem management is coordination between all sectors using or impacting on marine ecosystems. Nevertheless, much can be achieved by fisheries management agencies inachieving ecosystem-based management of fisheries.

The implications of implementing EBFM are, in fact, not new, and have already been mentioned in the FAO Code of Conduct for Responsible Fisheries which includes the conservation of the aquatic ecosystems in its General Principles as in Art 6.1, which says 'States and Users of living aquatic resources should conserve aquatic ecosystems'. The Code also refers to the "protection of living aquatic resources and their environments and coastal areas" (Art.2) and to "respect biological diversity" (Code Introduction).

A first step in moving towards EBFM is to identify and describe the different ecosystems and their boundaries, and then to consider each as a discrete entity for the purposes of management. Thereafter, ecosystem management objectives must be developed. The central objective of EBFM is to obtain optimal benefits from all marine ecosystems in a sustainable manner. This requires the maintenance (or rebuilding) of the ecosystem, its habitats, and biodiversity to a status capable of supporting all species at levels of maximum production. In pursuing this central objective, many if not most of the main conventional fishery management objectives and constraints remain inescapable even though subject to ecosystem constraints: e.g., improvements in fishing technology (which should not be stopped); maximal production (to match growing demand for food); maximum employment (particularly in highly populated and poor areas, along coastal deserts, etc.); minimisation of conflict (within fisheries but also among different sectors). Equitable allocation of resources through systems of rights remains a central challenge.

There are many other objectives referred to in the Code, including; protection and restoration of critical habitats such as wetlands, mangroves, reefs, lagoons, nursery and spawning areas from degradation, destruction, pollution, etc. from human activities (Art.6.8; 7.6.10); maintenance of the quality, diversity, and availability of resources (Art.6.2); restoration/rehabilitation of populations and stocks (6.3;7.2.1); conservation of biodiversity and population structure (Art.6.6; 7.2.2); protection of endangered species (Art.7.2.2); and others. Important other objectives such as maintaining rural livelihoods or contributing to the foreign exchange balance will also continue to be considered.

In order to realize these objectives, all potential conflicts and inconsistencies need to be reconciled to arrive at a set of simultaneously attainable objectives encompassing biological, ecological, economic, social and institutional concerns. As in conventional single-species management, the objectives must be formulated and reconciled in full consultation with all legitimate interested parties to ensure that their collaboration is obtained in achieving responsible fisheries (Art 7.1.2).

Once the objectives have been identified and agreed upon it is necessary to establish appropriate reference points (Art 7.5.3) and/or sustainability indicators, reflecting the objectives and elements of particular interest in the ecosystem, to assist in monitoring the state of the ecosystem and the performance of management efforts. These sustainability indicators must be based on the best scientific evidence available. An appropriate monitoring system is required to ensure that the information necessary for tracking the state of the ecosystem is available when required, in order to assess regularly the state of the ecosystem and the impacts on in (Art.8.4.7; 10.2.4; 12.11).

Achieving the objectives in EFBM requires suitable management measures. Again the general principles used in conventional single species management will still apply, but will need to be extended. Overall, in setting management measures, attention must be given to (Art 7.2.2 a-g):

- avoiding excess fishing capacity;
- ensuring economic conditions which promote responsible fisheries;
- taking into account the interests of fishers, including those at sub-industrial levels;
- conserving bio-diversity, protecting endangered species and restoring depleted species;
- assessing adverse environmental impacts on the resources and addressing them;
- minimizing pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species and impacts on associated or dependent species.

More specifically, the Code provides for an assessment of impacts on target stocks, associated or dependent species (Art.7.2.3; 12) including those before introducing any new fishing method or operation in an area (Art.8.4.7; 12.11); reduction and minimisation of environmental impact (pollution, discards, ghost fishing) on target and associated, dependent, or endangered species (Art.7.2.2; 7.6.9); and prohibition of destructive fishing (Art.8.4.2); improvement of selectivity (Art.8.5.3; 12.10); reduction of impacts on target and non-targer stocks (Art.6.2; 12.10); prevention of over-fishing and over-capacity (Art.6.3) so as to ensure that the level of fishing is commensurate with the state of fisheries resources

(Art.7.6.1); assessing impact of climate change (Art.12.5) and other ecosystem-oriented considerations. Given the high levels of uncertainty concerning the status and dynamics of ecosystems and their elements, and their response to perturbation, emphasis on application of the precautionary approach is central to EBFM (Art. 7.5.1).

The problems associated with open access systems have been previously discussed and, in order to avoid these, the allocation of various forms of explicit legally enforceable fishing rights is integral to EBFM. In allocating rights, it is necessary to consider all aspects of the ecosystem, such as by-catch and affected species and impacts of gear on the environment. Further, the right to fish must carry with it the obligation to fish in a responsible manner, so as to ensure ecosystem conservation (Art.6.1).

As was the case in setting objectives, it is necessary to establish an effective consultation and decision-making process in order to consult regularly with all legitimate stakeholders on appropriate management strategies and other matters requiring attention. Broadening the scope of management to include the ecosystem will also usually mean increasing the number and range of interest groups. This will invoke greater time and costs for consultation and decision-making but is essential for ensuring compliance and co-operation. The same mechanisms and processes should be used to review the management system and measures regularly and to adapt them as necessary to respond to changes in the ecosystem or the objectives of the stakeholders.

Effective consultation is essential for compliance but in even the best systems, it will be necessary to establish effective enforcement systems as required (Arts 7.7.2; 8.8.1);

The above requirements imply that EBFM can and should be implemented now and with existing knowledge. Nevertheless, uncertainties in our knowledge and ability to forecast will detract substantially from the ability to achieve optimal management. In an effort to reduce these uncertainties it is important to promote relevant research on such subjects as:

- improving knowledge of the food webs, including prey and predators relationship, to facilitate consideration of possible ecosystem responses to different management actions;
- ensuring all critical habitats for the key species in the ecosystem are located and mapped and identifying and addressing any threats to these;
- improving the monitoring of by-catch and discards in all fisheries to obtain a better knowledge of the amount of fish actually taken;
- considering improved methods for consultation and joint-decision making so as to improve ecosystem governance;
- studying any threats to the marine ecosystems from human sources outside fisheries, whether land-based or marine, and investigating means to minimise these.

Concluding Remarks

The demand for improved fisheries management is very high, fuelled by local fisheries crises, constant media attention, growing concern by industry, and active role of the NGOs concerned with fisheries and environmental matters. Faced with a series of international instruments adopted at the highest level, and with direct implications on fisheries, governments and their fisheries authorities are expected to foster a significant change.

Given the fact that fishery management systems, based initially on single-species approaches and then increasingly including multi-species considerations, have failed in many situations, the question must arise whether the addition of yet another dimension, namely the ecosystems, offers better changes for achieving long-term sustainability of fishery resources. The answer will certainly include the essential point that first and foremost present fishery management schemes must be improved to contribute achieving this objective. EBFM cannot replace traditional schemes, it can only add to them and this added dimension has indeed potential to reinforce current approaches, because it will reduce the uncertainties inherent in current management decision making. Ecosystems factors not adequately taken into account in present fishery management decisions have all too often been the source of unpleasant surprises for fishery scientists and fishery policy makers alike, and of course for the fisherman.

It should be well understood that the broadening of the fisheries management approach does not call for any revolution. Adding ecosystems considerations to present methods can be done gradually. However, some evident changes are called for, the most important being:

- Instead of addressing a definite fish stock solely, the whole ecosystem and its components will have to be included in the considerations; this may well start with some factors only, also depending upon the availability of data.
- Definition of management objectives will be broader, without loosing sight of those of particular short-term interest to the fisheries sector.
- The number of reference points and indicators will increase, and thus the need to widen the scientific base for management decisions.
- The monitoring, control and surveillance systems will have to be strengthened with inevitably higher costs.
- The institutional arrangements will have to be strengthened and broadened to include non-fishery stakeholders and allow consultations with all legitimate interested parties on management objectives as well as management measures, although those from the fishery sector, including the fishermen themselves, will continue to be the nucleus.
- Stakeholders' engagement should be promoted through training and public awareness programmes.

- A considerable extra effort in research will be required; not only targeted at verifying indicators and reference points, but also on the economic and social implications of EBFM, including e.g., the equitable sharing of costs and benefits between stakeholders.
- A visible leap ahead in assisting developing countries should be made to increase their capacity to introduce this wider fishery management concept into their fisheries.

Although it is the responsibility of States to efficiently manage its marine fishery resources, it is in the interest of all stakeholders to reduce the uncertainties associated with current fishery management systems. Among the main medium-and long-term beneficiaries will be the industry itself and the fishermen. It will therefore be in their interest to meet the challenge and take a more prominent role in the promotion and design of EBFM approaches. A successful EBFM must be founded on their will to meet these challenges.

Source : *Background paper prepared by FAO for the Reykjavik Conference on Responsible Fishery in the Marine Ecosystem circulated at the Reykjavik Conference on Responsible fisheries in the marine ecosystem : October 1-4, 2001 - Reykjavik, Iceland.*

Curbs on fishing may go: Kerala Fisheries Minister

Prof. K.V.Thomas is reported to have told Kerala assembly recently that there were differences of opinion regarding the timing and duration of ban on trawling. The Fisheries Department of the Cochin University of Science and Technology (Cusat) and the Central Marine Fisheries Research Institute (CMFRI) had been asked to conduct a detailed study in this regard and the report was expected to be ready in a year's time.

The Minister said that the Government was in favour of a trawling ban to coincide with the ban period in Karnataka waters. Prof. Thomas said the Government would coordinate with the neighbouring States to limit the number of boats operating off the Kerala coast. While a viable limit was a total of 2,000 mechanised and traditional boats, about 8,000 boats were operating off the State at present.

An expert committee had been set up to study fish diseases caused by the excessive use of pesticides in the Ashtamudi Lake, the Minister said. It had come to Government's notice that the unscientific use of pesticides in agricultural belts such as Kuttanad was responsible for the depletion of inland fish wealth.

The Minister said it would be ensured that fish ranching in inland water bodies would be undertaken in consultation with people's representatives. The Fisheries and Forest Departments would jointly launch a scheme to encourage Adivasis to take up fish rearing in reservoirs in Idukki district.

Neospark's Technical Seminar on Water Bio-Remediation

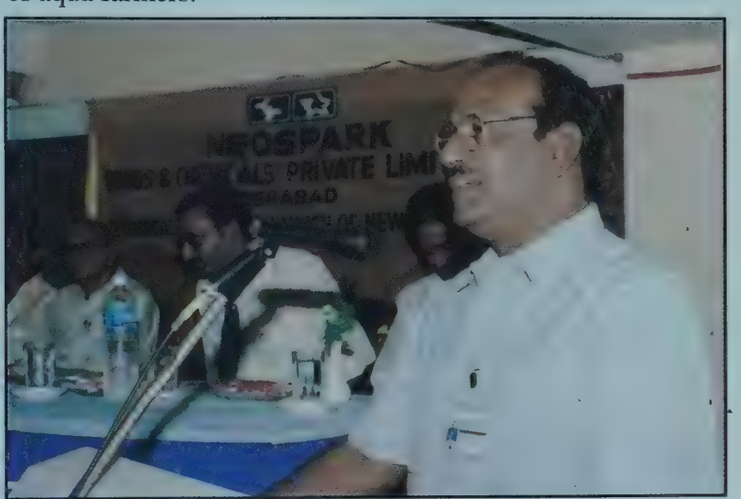
(Conducted as part of launching of Water Probiotic "BioRemid-Aqua") at Kakinada and Amalapuram, A.P; 19-20 February 2002.

A Water Probiotic product "***BioRemid-Aqua***" has been developed by M/s.Neospark Drugs and Chemicals Pvt. Ltd., Hyderabad. This specific, produced as a result of sustained efforts, is virtually a boon to aquafarmers. The standardisation of the product ***BioRemid-Aqua*** is the result of adoption of a new approach of Bio-Remediation (ecological aquaculture). Through field tests the company has found that ***BioRemid-Aqua*** has the much coveted property of generating probiotic bacteria in profusion in grow-out ponds. The results of trials conducted with the product had clearly shown that it improved water quality by balancing population of bacteria in the pond water and reducing pathogenic bacteria.

The presentations made at the technical seminar have spread the good news that ***BioRemid-Aqua*** is poised to upgrade aquaculture environment and augment healthy production of shrimp, and that this would go a long way in stepping up the incomes of aqua farmers.

Prof.K.Gopala Rao, Associate Dean, Fisheries College, Acharya N.G.Ranga Agriculture University, Muthukur, Nellore, A.P., explained to the farmers the role of Water Probiotics in Aquaculture. He said that, in the past 20 years, aquaculture industry had been growing in leaps and bounds, especially in respect of shrimp and prawn. It was pointed out that, in the year 2000, the global shrimp production reached an estimated level of 8,65,000 mt. Feed mills around the world produced 1.2 million mt of shrimp

Dignitaries on the dais L ~ R Dr. A.V. Rao, Mr. P. Haribabu, Mr. D.S.V. Subbaraju (Maniraju), Dr. K.V. Narasimham, Prof. (Dr.) K. Gopala Rao, and Mr. G. Chandrasekhar



Prof. (Dr.) K. Gopala Rao speaking on 'Role of Water Probiotics bodies in Aquaculture'

Prof. (Dr.) K. Gopala Rao (extreme left), Associate Dean, College of Fisheries, Nellore launching *BioRemid-Aqua*. To his right are Mr. G. Chandrasekhar, Director, Neospark and Mr. P. Haribabu, Asst. Prof., College of Fisheries, Nellore

Mr. U. Ankamma Rao, Director, Neospark assuring the farmers about the package of technical services available from the company.

feed. Pointing out that shrimp culture all over the world had been frequently affected by viral and bacterial diseases resulting in huge losses, the Professor said that, although diseases posed a serious threat to penaeid shrimp aquaculture, the production of these highly valued crustaceans continued to grow for the reason that both horizontal and vertical transmission of the viral pathogens could be controlled by taking various preventive and remedial steps. He further pointed out that prevention and control of the diseases was the best method for protecting and improving the health of animals under aquaculture. The aquatic environment would have to be improved by eliminating pathogens in the culture medium to the extent possible. He said that their elimination would be a tough task calling for improvement of ecological environment of aquaculture, and this aspect had become the focus of attention of international aquaculture industry. In this context, researchers had proved that the use of probiotic bacteria in aquaculture was effective in improving water quality by balancing bacterial population and reducing pathogenic bacterial load in water medium. It was mentioned that in the pursuit of this new approach towards bioremediation, considerable headway had been made. He also told the farmers about the importance of water probiotic in the production of healthy culture shrimp and prawn, and the recent breakthrough achieved by Neospark in standardising the product ***BioRemid-Aqua*** which had been tested and found to be an excellent additive for keeping pond waters free from harmful bacteria, thereby ensuring healthy shrimp crops.

Mr. P. Haribabu explaining to the farmers the various precautions to be taken to ensure healthy aqua crops.

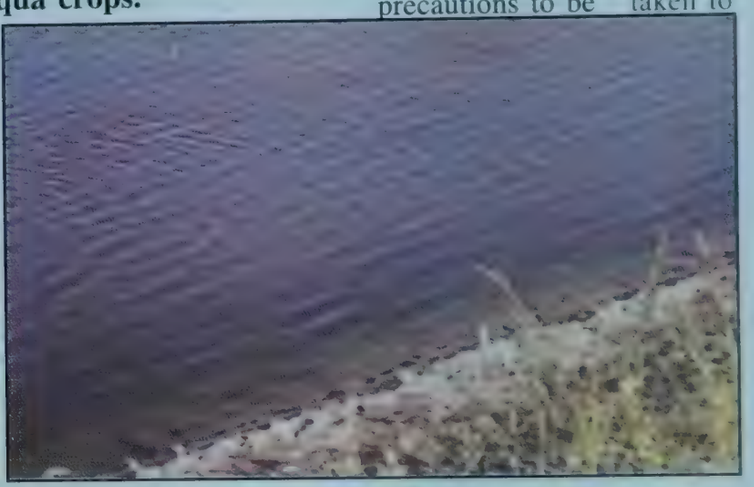
Mr. G.Chandrasekhar, Director, Neospark, explained the range of products available from his company for ensuring healthy shrimp crops, and gave the good news that ***BioRemid-Aqua***, a product that would keep pond waters clean and rich with probiotic bacteria was developed by Neospark. Requested by him, Prof. K. Gopala Rao launched the product, amidst applause from the farmers.

Dr. K.V.Narasimham, retired Scientist, Central Marine Fisheries Research Institute, told the farmers about the new and emerging technologies for augmenting aqua production in an enduring manner. He hoped that the farmers would endeavour to apply these technologies and augment production and their incomes.

Mr. U. Ankamma Rao, Director, Neospark, assured the farmers that a package of timely services from the technical personnel of the company would always be available to them.

Mr. P.Hari Babu, Assistant Professor at College of Fisheries, Nellore, explained to the farmers the various precautions to be taken to ensure healthy aqua crops.

Before use of *BioRemid-Aqua*



After use of *BioRemid-Aqua*

Further to Prof. Gopala Rao's commendatory remarks on the efficacy of ***BioRemid-Aqua***, Dr. A.V.Rao, Manager, Technical services, Neospark, explained to the farmers, the cause for the incidence and spread of viral diseases among shrimps under culture, and the successful formulation of ***BioRemid-Aqua*** to prevent and control these diseases. It was explained that increasing stocking density had been seen to result in an increasing accumulation of organic matter at the bottom of aquaculture ponds. As a result, more wastes were produced. These wastes consisted of unconsumed feed, excreta, discarded shell moults, faecal matter, etc., which accumulated in the sediment. Here they underwent degradation resulting in the formation of ammonia, nitrite and hydrogen sulphide. It was mentioned that, as ammonia and ni

Continued at P. 63

Aquaculture

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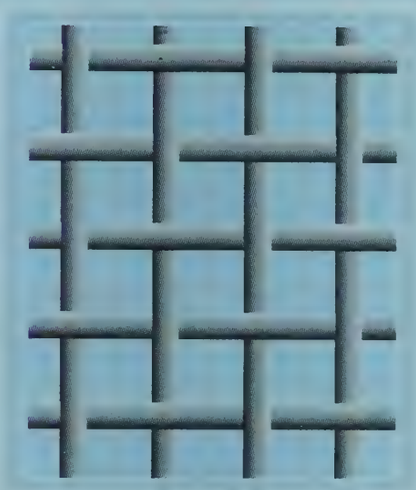

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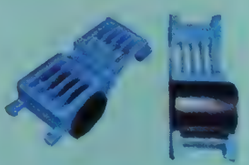
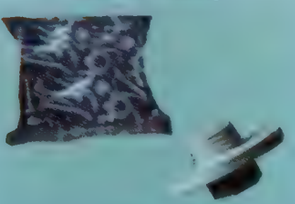


Bearing Cover& Rubber Bushing

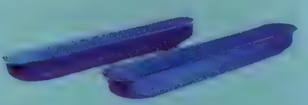
Bearing Stand

Plastic Shaft

Plastic Frame

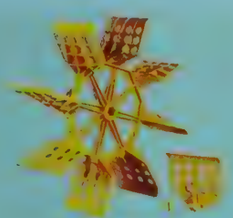


Screw Package & Plastic Nut



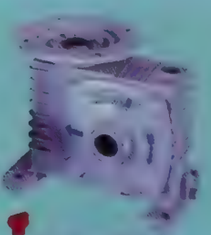
PE Float

PE Cover

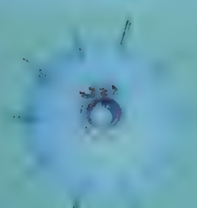


Plastic Impeller

Motor



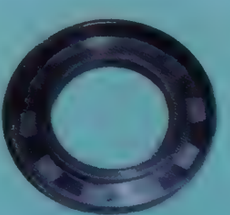
Reducer(14:1)



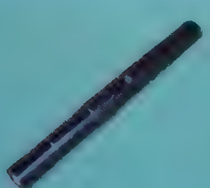
Motor fan

Reducer Bearing #6306

Reducer Bearing #6206



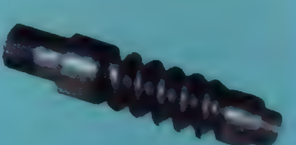
Oil Seal



Output Shaft

Worm Gear Wheel (14:1)

Reducer Bearing #30305



Input Shaft ((new 185mm)

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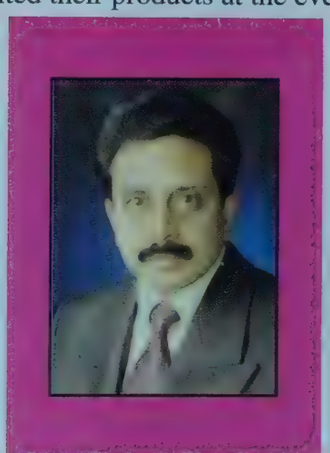
New World Saigon Hotel, Ho Chi Minh City, Vietnam
27-28 January 2002

The captioned conference is the fourth in the series of annual professional sea food shows to be conducted in Vietnam. It was ably organised by the Vietnam Association of Seafood Exporters & Producers under the leadership of Mr.Nguyen Huu Dung, its Secretary-General, and it attracted a large number of participants from various parts of the world.

Around 110 exhibitors from Vietnam, USA, Japan, Thailand, Taiwan, Singapore, Australia, China etc., exhibited their products at the event. The exhibition attracted nearly 20,000 visitors from various countries. Vietnam's sea foods are exported to 60 destinations, with the bulk of exports going to Japan, USA and China. A recent development is that several factories have taken to processing of value-added products including ready-to-eat products. Chief among the guests of honour and speakers at the conference were Messrs. Katsuhiko Shimizu, Shrimp Group Manager, Nichirei Corporation, Paiboon Ponsuwanna, President, Thai Frozen Foods Association, Peter Red Mayne, President, Sea Fare Group (Marketing Communications), Mike Urch, Editor-in-chief, *Seafood International*, Herby Neubacher, Editor-in-chief,

Mrs. Nguyen Thi Hong Minn, Dy. Minister of Fisheries, Vietnam, and Chairman of VASEP



Mr. Y. Surya Rao, President, Seafood Exporters Assn. of India, A.P. Region

Mr. Paiboon Ponsuwanna, President of Thai Frozen Food Association

Mr. Peter RedMayne, President, Sea Fare Expositions, and Sea Fare Group-Marketing Communications.

Mr. Mike Urch, Editor-in-Chief, *Seafood International*

Mr. Herby Neubacher, Editor-in-Chief, *FischBeuro*

Mr. Markus Stern, Director of Swiss Import Promotion Programme Organization

Mr. Song Shuyi, President of China Kingdom Import Export Company Mr. Nguyen Huu Dung, Secretary General of VASEP.

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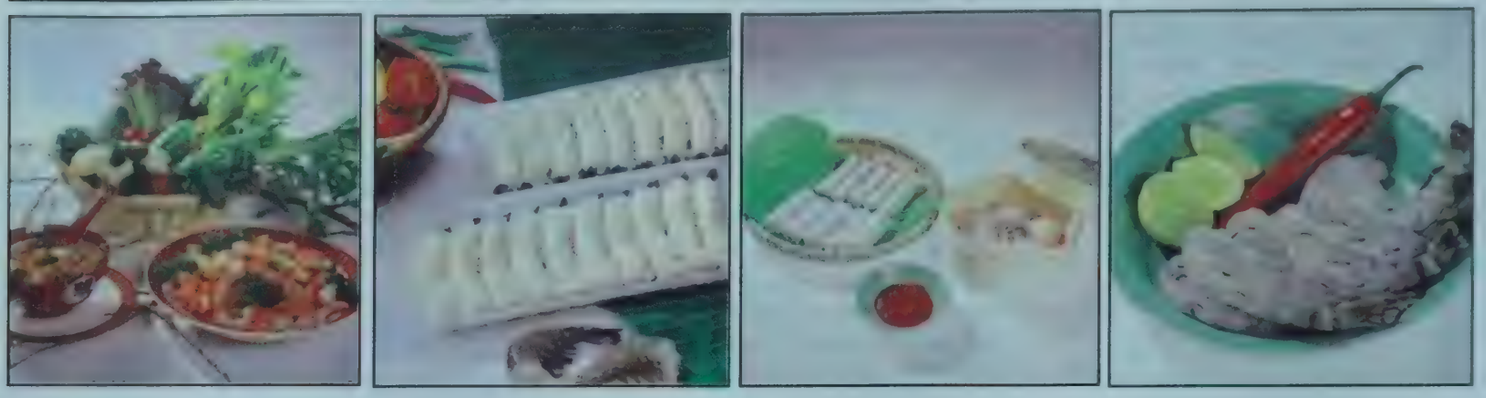

Vietnamese value-added Products

Fisch Beuro, Markus Stern, Director of Swiss import promotion programme Organisation, and Mr. Song Shuyi, President of China Kingdom Import- Export Company and Mr.Y.Surya Rao, President, Seafood Exports Association of India, AP region.

The event was inaugurated by Mrs.Nguyen Thi Hong Minn, Deputy Minister of the Ministry of Fisheries and also Chairman of Vietnam Association of Seafood Exporters & Producers. Briefly outlining the progress made by Vietnam in the production and export of marine and freshwater aqua products, and the support extended by the government to the industry, she sought the cooperation of the participants for the success of the conference for the promotion of world seafood market.

Mr. Katsuhiko Shimizu, Shrimp Group Manager, Nichirei Corporation made an impressive presentation on the topic "Japanese Shrimp Market-Outlook for the Future". It started with an introduction to the trend and movement of present Japanese shrimp Market. He brought out five current characteristics of the Japanese shrimp market: 1) After 1989 unrealistic price distortions swept the market which had lowered retail prices and this trend had drastically reduced overall prices of all food items to very low levels; 2) Eel and Salmon became the biggest competition to shrimp products, keeping shrimp prices low; 3) The distribution channels continued to be infested with redundant middlemen. Major changes in shrimp business framework were now pressurising shrimp distribution channels to change; 4) The present trend of consumption was now gradually shifting to the prepared or precooked foods and semi-processed foods which were increasing in demand; 5) People's image of shrimp as a high grade food had changed with the increase in imports of lower priced black tiger shrimp, particularly because deep fried black tiger shrimp tended to become tough and chewy.

The speaker made extensive observations on distribution channels in Japanese shrimp market. As middlemen were being increasingly squeezed out, importers were facing the problem of bearing market risks of shrimp back-to-back business. He said that this had rendered profit making from sale of shell-on shrimp very difficult. For this reason most of the companies were shifting to imports or production of value-added products such as semi-processed or pre-cooked shrimp. Referring to major wholesalers, Katsuhiko explained that major whole salers were facing problems as some big users were importing shrimp on their own to cut costs and middlemen (A new phenomenon called 'disintermediation'). So far as distributors are concerned, he said that lot of restructuring was taking place. Medium and small size distributors were merging in order to acquire major trading houses in Japan in order to step up their activities. He said that it was only a matter of time before most of the wholesalers bowed out of the market leaving only the large and financially secure companies to survive after the merger and acquisition of the small competitors. He also referred to the severe competition to which institutional channels (restaurants, cafetarias, fastfood outlets), sushi industry, soba (Japanese noodle) shops, family restaurants, hotels and inns, supermarkets, Volume Fresh Seafood Retailers (VFSP), Food Manufacturers (FM) were exposed.

One shrimp display pattern in Vietnam

Katsuhiko Shimizo gave his assessment of the outlook for Japanese shrimp market. His forecast was that shrimp prices would come down for various reasons, one of which was the anticipated sharp increase in production of farmed black tiger in countries such as India, Vietnam, Indonesia, Thailand, China etc. The other main reason for the expected drop in prices was the problem of much lower disposable incomes in Japan. He expressed the view that Japanese consumer would buy shrimp, only when criteria of confidence such as, shrimp was good and safe for health and was delicious, were met. He advised both producers and exporters of shrimp to Japan to produce and supply shrimp that conformed to the concept of 'Sticking to the Best'.

Mike Urch, Editor-in-Chief, *Seafood International* spoke on 'Trends in Euro

Continued at P. 64

International Symposium

FISH FOR NUTRITIONAL SECURITY IN THE 21ST CENTURY

Central Institute of Fisheries Education, Mumbai
4-6 December, 2001

The captioned International Symposium was held at the Central Institute of Fisheries Education (CIFE), Mumbai from 4-6 December 2001. It was sponsored by the Indian Fisheries Association, (Located at CIFE), Asian Fisheries Society (Indian Branch), Mangalore, Society of Fisheries Technologists, (Located at CIFT, Kochi), Inland Fisheries Society of India, (located at CICFRI, Barrackpore), Association of Aquaculturists, (Located at CIFA, Bhubaneswar), The Marine Biological Association of India, (Located at CMFRI, Kochi) and Indian Society of Fisheries Professionals, Mumbai. The Symposium was co-sponsored by ICAR, CIFE, CIFT, CMFRI, CIFA, CIBA, NBFGR, NRCCF, CSIR, MPEDA, National Academy of Agricultural Sciences, Indian National Science Academy, New Delhi and E.Merck India Ltd., Mumbai.

The event attracted the participation of an array of delegates consisting of scientists, technocrats, nutritionists, farmers, administators and academicians. The presentations made at the symposium were focal, generating well considered recommendations.

Prior to the inauguration of the symposium a Farmers' Meet was held, at which Dr. K.Gopakumar, Deputy Director General (Fisheries), ICAR, announced amidst cheers from the farmers, that Rs. 3 lakhs were granted under Technology Development Programme for farmers' development. Dr. P.V.Dehadrai Retired Dy. D.G.(Fisheries), ICAR emphasised the need for granting subsidy to compensate for the steep increase in fuel prices which had led to economically disadvantageous mechanised fishing boat operations. Gopakumar, pointed out that a large number of fishermen's co-operatives were set up in Thailand to manage mechanised fishing boat operations and post-harvest operations, such as processing for common benefit. Domestic mar

Dr. S. Ayyappan welcoming the participants

Prof (Dr.) M.G.K. Menon delivering the inaugural address

Prof (Dr.) M.G.K. Menon in conversation with Dr. S.N. Dwivedi and Dr. S. Ayyappan

Section of participants

Dr. Pedra Bueno making his presentation at Tech Session II

Dr. M.G.K. Menon opening the exhibition 'Meen Milan' organised for the occasion

keting function was carried out by womenfolk. He exhorted the participating fishers to emulate this Thai example.

The symposium was inaugurated by Prof. (Dr.) M.G.K.Menon, Dr. Vikram Sarabhai Distinguished Professor. Dr. K.Gopakumar, Deputy Director General (Fy), ICAR presided over the meeting. Among the Guests of Honour were Dr.S.A.H.Abidi, Member, ASRB, New Delhi, Dr.S.J.Kaushik, Director, INRA, France, Prof. T.J.Pandian, ICAR National Professor, Madurai Kamraj University, and Dr. Pedro Bueno, Coordinator, NACA, Bangkok.

Dr. S.Ayyappan, Director, CIFE and President of Indian Fisheries Society welcomed Dr. M.G.K. Menon, the other dignitaries and distinguished participants. In his address, highlighting the crucial role of fish in stepping up national nutritional security, he spoke on the nutritional importance of fish, particularly in developing countries which held a high growth potential. He added that fish stock management was considered as one of important factors to achieve nutritional security in developing countries.

The Indian Fisheries Association honoured Prof. (Dr.) M.G.K.Menon and presented a citation. Dr. S.J.Kaushik, world renowned Nutritionist from France, and Dr. Bueno Pedro, Co-ordinator of NACA too were honoured by the Association with presentation of citations. The other dignitaries honoured with citations for their contributions to Indian fisheries development were Dr.K.Gopakumar, Dr.S.A.H. Abidi, Prof.(Dr). T.J. Pandian, Dr. S.N. Dwivedi, Dr. P.V. Dehadrai, Prof.(Dr).H.P.C Shetty, Dr. M. Sakthivel and Mr. J.V.H. Dixitulu. Fellowships of the Association were conferred on Drs. G.P. Dubey, N. Desai, T. Rajyalakshmi, S.C. Pathak, C.S. Singh, M.A. Upare and Y.S. Yadava. After brief response speeches by Dr. Abidi, Dr. Kaushik, Prof.(Dr) T.J. Pandian and Dr.Beuno Pedro, Prof. Menon released, a) the current issue of Journal of Indian Fisheries Association, and b) Abstracts of the papers contributed for presentation at the symposium.

In his inaugural address, Prof. Menon spoke at length on the imperative need to translate in good measure the perceived importance of fish to contribute in a big way to the nutritional security of the country. He described fisheries development of India had progressed to a crucial stage at which further production could explode at any time. Pointing out that very little was known about oceans compared to land, he said oceans held the key for climatic and temperature changes and that, unfortunately, they had become sinks for organic and inorganic wastes. Articulating the intimate connection between oceanography and fisheries, he said that remote sensing technology had opened up new opportunities to the fisheries sector. Highlighting the trend of transition from capture to culture fishery development, Menon warned of infections and diseases which could be mostly viral in nature, and which might surface, in case intensive systems took over the scenario causing problems that might materialise due to use of antibiotics. Oceans were wealth, not for fish alone, but for other proteinacious sources such as algae too, the professor observed. Saying that unfortunately there was no focus on this aspect even in scientific circles, he had recalled to the attention of the participants the priority accorded in China for fisheries development and the remarkable strides made in that country in pursuance of that endeavour. Referring to Andaman and Nicobar Islands, he made an important point. Though not suitable for agriculture, the fisheries resources of the vast sea zone around the islands could be exploited in a sustainable manner. He had also highlighted the enormous work to be done in the country by way of upgrading post-harvest operations.

Dr. K. Gopakumar, pointing out that India possessed the third largest protein system of the world, laid emphasis on cage culture in reservoirs as an important means for enhancing reservoir fish production. He introduced the idea of formation an Academy of Fisheries to serve as an united body in the place of a plethora of existing scientific and academic fisheries bodies. Considering the low prices that fish farmers realised for the crops they raised, he underscored the need for imparting value addition to the produce through domestic marketing sys

tem supported by a cold chain and through development of export market for Indian major carps. The crucial urgency for the development of domesticated tiger shrimp broodstock through selective breeding was highlighted. He put forth a refreshingly new concept of economic utilisation of inland saline water bodies. Adopting evaporation and condensing system, the condensed water could be collected for freshwater fish culture and a salt industry could be developed utilising the remaining crystallised salt. He exhorted the private sector to undertake R&D work for the development of fish and crustacean vaccines. Concluding, he exhorted the fisheries industries to strive harder for enhancing sustainable production from both marine and inland sectors. Dr. K.Pani Prasad, scientist at CIFE, proposed a vote of thanks.

The inaugural session was followed by a Keynote Address Session, Technical Session I, a Special Session on Fish Nutrition, Technical Sessions II to V, and Plenary Session, with a intervening workshop on 'Radiation Processing of Foods'.

Keynote Address

The keynote address was delivered by Dr. S.J. Kaushik, Director, INRA, France, on the topic "Fish in Nutrition", at a session chaired by Prof. T.J. Pandian, with Dr. Pedro Bueno as Co-Chairman and Dr. A.K. Ray as Rapporteur. While providing a wealth of information on the eminent role of fish in human nutrition (Fish is low in calories and high in protein content, rich in micronutrients, in Omega 3 PUFA, and in free amino-acid and soluble protein), he explained that fish oil was beneficial to human health, reduced platelet aggregation and that plasma triglycerides had fat soluble vitamins etc., to mention some. He said that a decrease in total serum cholesterol and increase in HDL cholesterol was noticed in fish eating persons. It was pointed out that, while global average per capita fish consumption was 16 kg, the range for this in India was 5-6 kg and 80 kg in Japan. He pleaded for expansion and sustainable intensification of aquaculture production, adopting recirculation and other tested beneficial systems, so as to meet the mounting global demand for fish which could not be met adequately out of capture fishery output, as it was declining, and from the present level of aquaculture production. He emphasised the inevitability of co-habitation of capture fisheries and aquaculture, and effective and sustainable management of fisheries resources to ensure nutritional security and for meeting the demands of increasing population.

Technical Session I

T.J. Pandian presented a paper entitled "Fish for Nutritional Security of Indians". Saying that, with availability of 2.4% of the global land area, India had to nourish and sustain 16% of the world population, he emphasised the need for utilising the available fish resource potential for enhancement of nutritional security. He pointed out that the high fecundity and fast growth rate of fish were biological advances which enhanced the scope for increasing production and achievement of nutritional security. He lauded the significant achievements of CIFRI and CMFRI.

Pandian had pleaded for a national policy for management of fisheries of water resources and for the development of an enduring legal frame work for sustainable aquaculture. Pointing out the deficiencies of fish meal produced in India, the major raw material for aquafeed preparation, he said efforts were needed to upgrade the quality of Indian manufactured fish meal. He was however appreciative of Mahima I and Mahima II feed formulations standardised by CMFRI. He had also endorsingly assessed the major feed formulations worked out by Alagarswamy and Ali of CIBA. His estimate was that the annual aquafeed requirement of India was of the order of 5,204,500 t.

Dr. Pedro Bueno NACA Co-ordinator, spoke extensively on "NACA's Policies and Programmes in Aquaculture Development, in Support of Poverty Alleviation and Nutritional Security". He explained in detail, the work programme of NACA from 2001-2005 which supported Regional Aquatic Resources Management, Aquatic Animal Health Management in Asia-Pacific in relation to shrimp farming and environment, and regional collaboration on aquaculture education. His presentation also covered sub-regional assistance and initiatives of NACA. The assistance to India's shrimp health management by NACA along with ACIAR and other Australian agencies to provide a solution to help management as well as environmental issues associated with India's shrimp culture industry was elobrated by him. He added that the project was conducted in Andhra Pradesh in co-operation with two Indian Government Agencies (MPEDA and ICAR). He also mentioned about the expert consultation on intensification of food production through freshwater aquaculture, held in October 2001 at CIFA, Bubhaneswar, co-organised by FAO and NACA, and to the formulation of a Trans- Himalayan network of coldwater fisheries and fishery resources at a regional workshop held in Kathmandu in July 2001. He gave details of the regional and sub-regional projects taken up by NACA and also the programmes and projects undertaken in the region by NACA as a major participant, in 1990-2001.

Y.S. Yadava, Interim IGO Co-ordinator of FAO, Bay of Bengal Programme, spoke on the role of "BoBP in Sustainable Development of Fisheries". He made an impressive presentation on the development of technologies, catches and incomes out of small scale fishery, coastal fisheries management in the Bay of Bengal, all aimed at contributing to the nutritional security of the nation. The breakthroughs achieved by BoBP in beach craft development, Kattumaran improvement, shrimp farming, extension training, pen culture, introduction of high opening trawls etc., were highlighted.

N. Rajshekar of the Directorate of Animal Disease Monitoring and Surveillance, Bangalore, spoke on the various softwares developed by his organisation and explained the possible uses of the

software for listing of freshwater fish farms, lakes/brackishwater farms, and for providing indications on fisheries trends, distribution of fishing areas, fish population profiles and also fish disease profiles.

P.V. Dehadrai spoke on "Nutritional Security through fisheries and Aquaculture in India". He highlighted the issues and policy options related to aquaculture, institutional support needed for development of the activity, priorities in aquaculture, and strategies of development. He explained the limitations to freshwater aquaculture/researchable issues covering fish seed production, disease control, cropping period, diversification, marketing etc. He also spoke extensively on the issues and strategies concerning development of reservoir fisheries, coldwater aquaculture, brackish water farming, mariculture, riverine fisheries, inter-state river management, legislative reforms etc. He suggested replacement of fish meal with soyabean in fish feeds and also pleaded for introduction of recirculation systems in aquaculture for augmenting fish production.

M. Sakthivel, Chairman, Aquaculture Foundation of India, spoke on "Challenges of Nutritional Security and the Battle for Blue revolution in the 21st Century". He said that aquaculture today was neither agriculture, nor animal hunbandry, nor industry. So much so, none of the existing laws were relevant or applicable to aquaculture. In this situation, he said that a new law applicable for aquaculture would have to be promulgated. It was also mentioned that the promotion of dietary diversity through nutrition education programme was a vital requirement. He proclaimed that aquatic food would be the choice of 21st century. Sakthivel said that the creative potential of aquaculture to start blue revolution should not be confused with the destrucutive nature of capture fisheries (akin to wild hunting). Saying that entry into sea farming would be the next Indian conquest of the inner space of the oceans, he prophesied the inevitability of expansion of aquaculture into the oceans. He said that aquaculture development must be considered as an integral part of the overall devlopment of the nation. Continuing, Sakthivel said that communication/information gap and investment gap would have to be filled with a proper action plan. He alleged that organisations like FAO had forgotten the actual developmental work needed for promotion of aquaculture, having detained themselves irrationally and deflecting from the purpose, because of environmental terrorism. Stating that FAO concentrated more on code of conduct in aquaculture, having failed in bringing about a code of conduct in capture fisheries during the past fifty years. He wondered how soon FAO could succeed in enforcing a code of conduct in a sector like aquaculture which was just emerging or in its infancy. He observed that FAO needed a vision for ushering in "Blue revolution" through aquaculture, for the sake of nutritional security of millions of world's population. He exhorted the participants to arise, awake and contribute effectively to blue revolution to achieve nutritional security for all. Sakthivel also referred to shrimp hatchery problems, artemia crisis, and the unwillingness of Andaman administration for the setting up of shrimp nauplii production centres on the islands. He also pleaded for the setting up of seawater distribution system for coastal farms and for the setting up of shrimp health care centres and for R & D initiatives for quality shrimp feed development. He said that the problem of quality shrimp seed supply to farmers could be solved only when domesticated broodshrimp stocks could be developed.

G.P. Dubey spoke on "The Impressive Achievements in Aquaculture and Reservoir Fisheries Development in M.P.". He said that fish production had increased from 35,000 t to 1.5 lakh t per annum in the past 22-25 years in Madhya Pradesh. The increase in production contributed to nutritional security in the State.

S.C. Pathak spoke on "Development of Fisheries in 21st Century". He alleged that there was some measure of complacency in fishery sector in respect of availing of loans from banking sector, citing the absence of any protest from fishery sector when NABARD reduced the provision towards refinance to provide loans to the fisheries sector. He expressed his unhappiness that commercial banks were diverting funds meant for aquaculture to other lines of fishery activities. He had pointed out that India did not have a single fish market comparable to even a modest international market. Rural Infrastructure Development Fund of NABARD was not utilised by the industry except for one project in Orissa. Concluding, Pathak said that commercialisation of aquaculture was very important at this juncture. Taiwan produced 60 tonnes of fish in a small area of 40 x 20ft, whereas when we produced 1.5 t/ha we were worried about ecological effects, when there were none. One indicator of lack of public interest in fisheries was that the articles on fisheries rarely appeared in newspapers of India. He proposed that a fillip may be given to popularisation of fish farms among ecotourists.

M.A. Upare presented a paper entitled "Fish Nutrition: A key to Development", authored by himself and K.S. Mayadevi. It was pointed out that Rs.508 crores were given as loans in 1999-2000 by various financing institutions to the fisheries sector covering both marine and inland sectors with support from NABARD. So far as NABARD was concerned it was extending refinance to the sector for acquiring boats and nets, for setting up of hatcheries, for seed production, for undertaking fish farming, setting up of fish meal plants, IQF plants etc., NABARD was also anxious to extend refinance for bivalve culture, sea weed culture etc. He had explained certain priorities for national action on nutrition in relation to fisheries. These included enhanced production of fish, promotion of activities of fishermen and fish farmers and fishery industries, export of aquaproducts etc.

Ravi Fotedar of Brenton Knott, Louis Evans, Australia, spoke on inland saline water culture in Australia. He said that Western Australia had over 70% of dry land salinity. An estimated 1.8 m ha of

farmland were already salt-affected to some extent and this area could double in the next 15-25 years. This situation had thrown up possibilities of expansion in mariculture in Western Australia. He gave details of technology followed for seed production and culture of pink snapper (*Pagrus auratus*) in inland saline water. It was pointed out that further research work was scheduled for culture of Barramundi, Lobsters, Artemia etc., in inland saline water.

Special Session on Fish Nutrition

There was a special session on Fish Nutrition, chaired by Dr. S.A. Kaushik, with Dr. G.A. Ravi Shanker as Co-chairman and Dr. S.D. Singh as Rapporteur. Ravi Shanker of CFTRI, Mysore, presented a paper on "Algae based Fish and Aquatic Feeds". He explained that cultivation of microalgae such as *Spirulina* and *Chlorella* had spread world-wide, for human consumption. He projected a species of algae for use as feed for bivalves under culture. It was mentioned that the use of fish meal could be eliminated completely in fish feed formulation by substituting algae-based formulated feed which would have protein level at 30%. The beneficial effects of *Spirulina* added to enrich shrimp feed for the survival of the early stage of *Metapenaeus* spp were explained by him. The highlight of his presentation was however in respect of Astaxanthin, which was an attractant pigment in green algae and also in some higher plants besides several others such as fungi, yeast etc. It was pointed out that aquafeeds enriched with astaxanthin were found to provide attractive pigmentation to shrimps and fishes. Astaxanthin was also found in many fishes, shrimps and lobsters, he added. It provided protection against oxidation and photo-oxidation, and helped in reproduction and development, imparting resistance to disease, he said in conclusion.

M. Sarala Mathew, Nutritionist, Breach Candy Hospital, Mumbai told the participants ten ways fish oil fought heart diseases. These were: a) Blocking platelet aggregetion in clotting; b) Lowering fibrinogen (clotting factor); c) Reviving up fribrinolytic activity (clot dissolving) d) Increasing blood flow; e) Reducing blood vessels constriction; f) Blocking cell damage from oxygen free radicals; g) Lowering of triglycerides; h) Raising HDL cholesterol, lowering LDL cholesterol; i) Rendering cell membrane more flexible, and j) Lowering blood pressure. Sarala Mathew said that lobsters possessed the leanest protein with high biological value. She recommended consumption of fish for fighting depression, reducing aggression, stimulating the brain, and blunting brain damage. Concluding, she said that reheating of oil for further use was dangerous to heart.

Ushakiran Sisodia, Chief Dietician, Nanavathi Hospital, Mumbai, spoke on "Fish and Nutrition". Saying that 'we are what we eat', she said that our food was our medicine. She said that fish including mackerel and tuna was high in omega-3 fat. It was mentioned that fish was a good source of calcium, and ω -3 fatty acids. Marine fish oil helped in prevention of cardiac artery disease. She mentioned that 3% of food intake should consist of essential fatty acids.

Gurupriya Koppikar of Mumbai Hospital, spoke on "Fish in Nutrition". As a preface to her talk, she said human heart problems were not seen in the coastal population for the reason that most of the people living in the region were fish eaters. She said Vitamin B 12 was absent in plant foods and that fish provided this vitamin. She observed that for a healthy heart 100g of fish/day should be consumed. She pointed out plaque gradually filled coronary artery. Pointing out that 8 g of N_6 and 0.2 to 0.5 g of N_3 were required for a healthy heart, she mentioned that 2g/day of fish oil was a good nutritional supplement and added that fish oil improved complexion. She advised that, to bring down cholesterol, one should avoid consuming shellfish.

A.K. Ray, presented a paper on "Probiotic effect of Isolated *Bacillus circulans*, on Growth Performance and Feed Utilisation Efficiency in Rohu, *Labeo rohita*, fingerlings", co-authored with Kaushik Ghosh, Suskanta Kumar Sen and Arun Kumar Ray. He explained that extracellular protease producing bacteria, *Bacillus circulans* was isolated from the gut of Rohu fingerlings. The probiotic effect of the isolated *B. circulans* was evaluated on growth performance and feed utilisation in Rohu fingerlings. There were five experimental diets supplemented *B. circulans* cells on which the fingerlings were fed at 1.5×10^2 and other varying concentrations for 60 days at 3% of the body weight in triplicate treatments. The control diet (1.5×10^1) was not however supplemented with bacterial cells. One of the diets with *B. circulans* cells at 1.5×10^5 exhibited significantly better growth, lower feed conversion ratio and higher protein efficiency ratio compared to other experimental diets. Intestinal amylase activity did not differ significantly beyond the inclusion level of 1.5×10^4 cells, whereas protease activity increased significantly with diets D3 (1.5×10^5) and D2 (1.5×10^4). He said that the results indicated beneficial probiotic role of fish gut microflora in providing nutrition to fish fingerlings.

R. Paul Raj, spoke on "Priorities in Mariculture Nutrition Research.

P.K. Mukhopadhyay, contributed a paper on "Sustainable Nutritional Security and Upgradation of Human Health Standard through Aquaculture". Providing nutrition profile of fishes, he referred to the implications of essential fatty acids in human health and nutrition. He said that humans required certain n-6 fatty acids in their diet to permit biosynthesis of eicosanoids like prostaglandins, thromboxin and leukotrienes, but cautioned that higher dietary levels that promoted excessive formation of n-6 eicosanoids should be avoided. He also explained some nutritional facts related to fish, such as high availability of lysine, less of connective tissue, lipids rich in mono and poly-unsaturated fatty acids, particularly of n-3 type, and vitamins like A,D,E,K and B-12, besides calcium, iron, phosphorous and iodine. The author also dealt with various environmental issues connected with aquaculture.

S.N. Mohanty spoke on "Certain Feed Related Issues for Sustainable Carp Farming". He had pointed out that the use of non- conventional feed sources had a particular relevance to regional wastes management for production, utilisation and economic gain, while keeping the environment clean. He recommended that food manufacturers should use large quantities of alternative protein sources in the manufacture of feed for carps, catfish and freshwater prawn at affordable cost.

P. Keshavanath read a paper entitled "Evaluation of Carbohydrate-Rich Diets through Common Carp Culture in Manured Tanks". Co-authors of the paper were K. Manjappa and B. Gangadhara. Pointing out that carp culture employing low protein, carbohydrate-rich diets could be one of the ways of reducing production cost, he explained the work done by his team to formulate diets including maize as a replacement of fish meal component either partially or completely. An evaluation of the use of formulated diets in manured tanks to assess fish growth in the presence of natural food was presented. Natural food contributed at least part of the protein required by the fish, he said. Four diets were formulated by him reducing the fish meal component by 10% from 30% to 0% and including proportionate quantity of maize. These feeds were fed for 120 days at 5% body weight to triplicate groups of common carps. The study revealed that common carp was able to utilise high levels of dietary carbohydrate especially when the protein content in the diet was low.

S.A. Ali made a presentation on "Role of Nutrition in Aquaculture Fish Production". Saying that nutritional imperatives played a significant role in the development of microparticulate and microencapsulated feeds for rearing early stages of fish and shellfish larvae and that simplified hatchery production of young ones had particularly helped in impressive shrimp and prawn production all over the world, the author discussed the role and contribution of nutrition to the growth and development of sustainable and environmental-friendly aquaculture.

C.T. Achuthankutty presented a paper entitled "Captive Shrimp Broodstock Production: Relevance of Eyestalk Ablation and its Regeneration in Gonad Maturation", authored by himself and Ulhas M. Desai. Achuthankutty explained the importance of developing captive shrimp broodstock. Narrating the global efforts in the promotion of captive shrimp broodstocks, by IFREMER in French Polynesia, US Marine Shrimp Farming Programme in USA etc., he had explained the technological aspects of selective breeding so as to produce viable broodstock through such number of generations as needed. He also explained in detail the merits and demerits of eyestalk ablation and regeneration possibility of ablated eyestalks etc.

Technical Session II

This session was held under the Chairmanship of Dr. P.V. Dehadrai, with Dr. P. Das as Co-Chairman and Dr. S.A. Ali as Rapporteur. S.N. Dwivedi, President, Academy of Scientists, Engineers and Technologists, India, spoke on the topic "Fish Provides Nutrition Security to the Rural Poor and Generates Export Trade". He underscored the necessity to provide high priority to lend support to research efforts for using fish and other aquatic produce to meet the nutritional needs of the people. By introducing fish culture in long seasonal irrigation reservoirs which were lying derelict, India could produce an additional 1.5 million mt of fish per annum by adopting relay culture technology, he observed. Saying that major research efforts were also needed to study the nutrition requirements of fish and crustaceans, he opined that these efforts would go a long way to enhance production from reservoirs and water logged areas. Development of reservoir fisheries of the country would enable India to emerge as an important producer and exporter of live fishes as well as processed fish products, particularly to countries in Asia, Middle-East and South America. Dwivedi also emphasised the need to revive training programme for fishery officers of State Governments at CIFE, which was abolished during the 9th five year plan despite its tested usefulness for stepping up fish production. Its revival during 10th plan would ensure higher production of fish from irrigation reservoirs for rural development and for self employment of fishermen. He also emphasised the fact that India now needed new systems to provide fish to the poor for upgrading their nutritional status and also to produce fish for profit. He highlighted the need to set up a National Centre of Excellence for Fish Nutrition and to set up regional centres for nutritional upgradation. He spoke on the imperative of formulation of fish feed from locally available raw material. He added that development of single cell protein, such as *Spirulina* on a large scale could meet the nutritional needs of the people to a large extent.

H.P.C. Shetty spoke on the "Trends of Fisheries Education". Pointing out that until now Agricultural Universities under ICAR were responsible for fisheries education, he said that certain non-agricultural universities such as Barkatullah University etc., had started P.G. Degree courses in fisheries. He felt that there should be some coordination between UGC and ICAR in respect of imparting fisheries education.

T. Rajya Lakshmi brought out the alarming problem of water shortage confronting the development of fish culture, and called for immediate steps to be taken to ensure that adequate water became available for fish culture. She also spoke on the on-going destruction of mangroves at places such as those at Koringa in A.P, because of effluents released from nearby industries. She suggested that an inter-disciplinary group was needed to be set up for monitoring aquaculture, coupled with water use policy.

J.V.H. Dixitulu, Editor, *Fishing Chimes*, spoke on the topic "Freshwater Culture Fishery Development for Nutritional Security: The Importance of the Dimension of Farmers' Income". Pointing out that Indian freshwater culture fishery sector was dominated by composite culture of Indian major carps, which over years had lead to a tendency towards di-

minishing returns to the farmers because of steep increase in the cost of inputs and declining market prices, he suggested that polyculture of species consisting of major carps and freshwater prawns/tiger shrimps would have to be promoted as one of the ways to ensure better returns to the farmers. He also pleaded for promoting Tilapia (GIFT/Nile) culture, supported by its monosex seed producion at protected and monitored centres. He pointed out that a large number of countries in South-East Asia were culturing GIFT/Nile tilapia, as a major market had developed for export of Tilapia fillets to USA and Europe. He suggested the setting up of GIFT/Nile Tilapia hatcheries preferably in private sector, under licenses issued by the Government and governed by a strict system of quality control for supply of certified mono-sex seed only to farmers, so as to ensure even when they entered wild waters no environmental harm would be done .

K.R. Prasad, spoke on "Importance of Blue Revolution in 21st Century". G.R.M. Rao spoke on "Opportunities and Challenges for Coastal Aquaculture in India".

. V.V. Sugunan made a presentation on "Role of Fisheries Enhancement in the Nutritional Security of Rural People in India". Explaining what enhancement connoted in respect of both capture and culture fisheries, he brought out the role and scope of enhancements, significance of different systems of inland fisheries to the nutritional and food security, Aquaculture Vs. Culture based fisheries, production potential of fisheries enhancements in India, the cost of fish production and advantages of enhancement etc. He said that fisheries enhancements in various forms offered scope of increasing fish production in inland waters. While being relatively eco-friendly, enhancement strategies could play a vital role in food and nutritional security, particularly to rural populations.

K.M. Shanker, spoke on 'Hybridoma Technology'. He explained about monoclonal antibodies produced by hybridoma technology. He outlined the efforts under way for producing oral vaccine in India and on popularising hybridoma technology in the country. He explained the advantage of application immunoglobulin in terms of sensitivity, simplicity, rapid results etc., and provided a comparison with PCR tests.

C.S. Singh, spoke on "Fisheries Based Integrated Farming System". He said that the farmers of small land holdings could easily be motivated to integrate their empirical skills of raising small livestock with fish culture and agriculture based farming systems. While conceding that integrated aquaculture would certainly not solve all the problems faced by rural farmers, he said that more sustainable integrated farming could provide short and medium term relief to poor small land farmers.

U.P. Singh, presented a paper on "Sustainable Enhancement of Reservoir Fisheries in Uttaranchal". The main point made by him was the natural recruitment of some of the fast growing indigenous fish species was possible by construction of bottom pits at suitable locations in different zones of various reservoirs of Uttaranchal. He pointed out that these pits would be flooded during monsoon season with water and fish species, particularly *Labeo gonius* which would breed profusely in flooded waters, particularly in flooded pits. Saying that the fishermen engaged in fishing activity depended on reservoir fisheries for 6-8 months in a year, he said that the catch data indicated the potential for fisheries enhancement in reservoirs located under Tarai region of Uttaranchal. He added that this would be helpful in contributing to food security and for upliftment of socio-economic status of the population residing in the vicinity of reservoirs.

Technical Session III

This session was held under the Chairmanship of Prof.(Dr.)P.C. Thomas, with Dr. T.R.C. Gupta as the Co-Chairman and Dr. Madan Mohan as Rapporteur.

P.C. Thomas made a presentation on Impact of Neuroendocrine/Endocrine Researches on Aquaculture". He spoke at length on the advances made in the area of neuroendocrinology/endocrinology. He said that these subjects paved the way for the standardisation of seed production technology related to several fishes. He elaborated on fish reproduction endocrinology, monosex culture and on hormones as growth promoters.

T.R.C. Gupta spoke on "Aquaculture - Environmental Concerns". He explained the components responsible for environmental concerns and spoke on the various aspects of phosphorus and nitrogen pollution from aquaculture etc.

B.S. Saxena presented a paper on "Fish for Nutritional Security in 21st Century", in relation to Indian population living below the poverty line. Explaining the concept of fish for nutritional security, he offered several suggestions to achieve fish nutritional security among Indian population living below the poverty line.

S.V. Sharma contributed a paper on "Freshwater Catfish Resources of India: An Option for Nutritional Security in the 21st Century". Saying that catfishes as a group were next in importance to carps in inland fish production, he emphasised the need to focus attention on the development of technology for the captive breeding and larval rearing of selected species of catfishes with growth potential so as to bring them within the fold of fish farming systems in India.

S.K. Verma contributed a paper entitled " Micro-toxins and freshwater aquaculture in 21st century". He gave details of some important micro-toxins, the source and characteristics of toxic effects and explained micro-toxin problems in aquaculture.

D.E. Babu made two presentations, one on "Larval Development of *Scylla oceanica*" and another captioned "A Review on the Status of Mud Crab Culture". Co-authors with D.E. Babu were D.V.S.N. Raju, K. Rama Rao and M. Ratna Raju. In presenting the former paper, it was pointed out that it took 6-14 days for embryonic development and

hatching of the crab. There were eight zoea larval stages in the development of *S. oceanica*. Two megalopa larvae were observed in the development. The second megalopa stage metamorphosed into crablet. It was mentioned that zoea larvae preferred live feeds, while megalopa preferred formulated granular feeds. In the other paper entitled " A Review on the Status of Mud Crab Culture", the authors covered the existing culture practices, status of seed production, larval feeds etc.

M.S. Chandge, presented a paper entitled "Fatty Acid Requirement of Larvae and Post-Larvae of Indian White Prawn *Peneaus indicus*". The paper was co-authored with R.Paul Raj. He pointed out that larvae and post-larvae of *Peneaus indicus* required fatty acid such as eicosapentaenoic acid and docosahexaenoic acid along with linolenic acid.

Discussion on setting up of National Body on Fisheries

During breaktime of the symposium, a discussion was held on a proposal to set up an Indian national body on fisheries and on the desirability of Asian Fisheries Society Indian Branch, (AFSIB) of continuing its affiliation with Asian Fisheries Society. The session was chaired by Prof. H.P.C. Shetty and Co-Chaired by Dr. U.P. Singh. Dr. P. Keshavanath was the Rapporteur. During discussions, on the first part of the proposal related to the setting up a national body on fisheries a consensus had emerged that there was need for setting up such a body. Some preferred to christen it as Fisheries Council of India, but some felt that it could be called as "National Academy of Fishery Sciences". A third suggestion was that it could be named as "National Fisheries society of India". During discussions, it was observed that as fisheries was already part of National Academy of Agricultural Sciences, there would be no explicit advantage in having another body for the same purpose under the name proposed. There was considerable support for the proposal to set up "Fisheries Council of India". The reasons for this were that fisheries courses, which were until recently offered under the State Agricultural Universities only were now faced with a new development. The latest trend was for the Academic Universities to start fisheries courses in industrial fisheries with grants from University Grant Commission. Such courses had been started in certain States. It was felt that, by setting up a Fisheries Council a system of degree recognition by it can be developed and such degrees can be listed. There was considerable support to this proposal from the students. They expressed themselves against according recognition to degrees other than those awarded by the Central Institute of Fisheries Education, (Deemed university) and other fishery colleges in the country set up under the State Agricultural Universities. Another suggestion was that the colleges of fisheries, and research institutes should be taken as partners in the new body proposed to be formed. There was a comment that UGC had taken up large scale funding of Universities for starting industrial fisheries courses, without consulting ICAR.

There was also a proposal for setting up a National Fisheries Society of India in the place of Asian Fisheries society (Indian Branch) for the reason that the consensus was to wind up the Indian branch of the Asian Fisheries Society.

While Dr. S. Ayyappan was in favour of the proposal for setting up a National Fisheries Society of India, he expressed the view that it would be desirable to consult Central Fisheries Institutes, State Fisheries Departments, Fisheries Associations etc., before winding up the Indian Branch of AFS. He deplored that, unfortunately, the Directors of the Central Institutes had not been able to participate in the symposium.

Workshop on Radiation Processing of Seafoods

This workshop, conducted as part of the symposium, was chaired by Dr. N. Ramamurthy, former Vice-Chancellor, Venkateswara University, with Mr. R. Ganapathy, Director, MPEDA as the Co-Chairman. Dr. S. Basu was the Rapporteur. Dr. A.K. Sharma made a presentation on "Preservation by Ionising Radiation". He explained the benefits of radiation processing of food for food security and safety. Radiation processing enhanced international trade through quality enhancement. He said that quarantining at importing centres was essential to check the presence of insect pests, noxious seed, microbial pathogens etc. It was mentioned that the advantages of this system were: a) highly effective, non-residue forming, b) safety of workers and environment would be ensured, and c) the radiation would penetrate deeper into the tissues under the cold process. Pointing out the limitations, he said that it was expensive and all commodities might not be amenable for this process. He said that application of radiation to food was done in low, medium and high doses. He explained the dosages : a) low dose applications (< 1 kGy), b) medium dose applications (< 1-10 kGy), and c)high dose applications (< 70 kGy). He said that the technology was environment-friendly, less energy intensive and reduced technical burden. It helped in overcoming quarantine problems and was commercially advantageous in promoting international and domestic fish trade. He concluded by saying that USA, China, France, South Africa, Holland etc., were the world leaders in radiation processing. While approval was required in India for radiation processing from the Ministry of Health etc., there were commerical irradiation facilities in Mumbai, Delhi, Bangalore, Jodhpur etc. He said that a radiation facility was expected to be set up in Bhubaneswar soon.

V. Venugopal of Food Technology Division, Bhaba Atomic Research Centre, presented a paper on "Radiation Processing for Conservation and Hygienisation of Fishery Products". Pointing out that it was essential to maintain high quality of Indian fishery products in order to command respect and reputation in importing countries, he said in this context that in the past over three decades extensive work had been done on the feasiblility of application of radiation - pasteurization by way of appli-

cation of low loads of gamma radiation of dosage at 1-3 kGy. The treatment led to preservation of fish without any loss of freshness and extended shelf life 2-3 times more compared with shelf life of untreated fish preserved in ice. He explained that the main process of radiation treatment consisted of radurization (cold pasteurisation), radicidation and radiation disinfestation. Mentioning that radiation problems were more with cultured fish, he said that transportation trials with radurized fish were successful. He added that 12 countries cleared radiated fish items for human consumption.

J.R. Dandekar spoke on "Radiation Processing of Seafood". He emphasised that radiation processing should be adopted only in respect of safe material for ensuring safety of seafood.

S. Lavale spoke on "Radiation Processing Plants". He said that several countries had set up radiation plants. He said low dose radiation was adequate for fish hygienation.

R. Ganapathy, presented a general review of Indian marine products export scenario. Daruwala and S.P. Damle also made presentations on the subject of "Radiation Processing". Daruwala said that EU representatives would soon be coming to India to interact with Indian processing industry.

Technical Session IV

This session was held under the Chairmanship of Dr. I.S. Bright Singh, with Dr. (Mrs) Kuldip Kaur as Co-Chairman and Dr. K.M. Shanker as Rapporteur. Presentations of several contributed abstracts were made at this session.

Technical Session V

This Session was conducted under the Chairmanship of Dr. G.P. Dubey, with Dr. S.V.Sharma as a Co-Chairman. Rapporteur was Dr.(Mrs) Asha Dhawan. The subject of the session was "Aquaculture Health Management".

K.M. Shanker, presented a paper on "Potential of Artificial Substrate Based Microbial Biofilm in Aquaculture". Pointing out that substrate based aquaculture was an emerging area, he said that there was enormous scope for further expanding the technology with various fish and shellfish species and appropriate substrates. However, he cautioned that economical and ecological aspects would have to be considered in the development and adoption of the technology. He had explained in detail the biological basis of augmented fish food production on substrates, bringing out the various aspects related to development of microbial biofilm on them, cell composition of biofilm and density of biofilm. He had also brought out the importance of microbial biofilm as food of fish and shellfish in aquaculture. The progress made in the development of substrate based aquaculture technology by the department of aquaculture of the college of fisheries, Mangalore, with funding support from Sweden was explained. He said that substrate based aquaculture yielded interesting results. It was pointed out by him that microbial biofilm growing on substrate had helped in ensuring water quality for promoting health, of cultured shrimp and fish. Use of 'Aquamats' as substrate in shrimp culture increased nursery seed production as well as juvenile growth, he said.

H.S. Murthy spoke on "Probiotic in Aquaculture for Enhancement of Growth and Disease Resistance". He explained the role of nutrition in aquaculture by way of promoting growth and survival of the cultured animals. He said that probiotics imparted disease resistence. He also spoke on the "Effect of HUFA in larval growth stages". He had explained that probiotics were nothing more than microbial feed supplement, considered to have the ability to suppress specific harmful bacteria and at the same time strengthening the immune system of the host.

S.M. Shivaprakash spoke on the "Unique Features of *Etroplus surantensis*". The highlight of his presentation was that 50% of energy in this fish was in the body region and 56.5% of the fish was edible.

Plenary Session

A plenary session followed. Chaired by Dr. K. Gopakumar, the Panel consisted of Drs. S.A.H. Abidi, S.N. Dwivedi, P.V. Dehadrai, S.J. Kaushik and S. Ayyappan. After prolonged discussions with the participants the panel arrived at the following recommendations.

1) A separate Ministry of Fisheries may be set up, considering the vast potential of fisheries development for enhancement of national nutritional security. In the alternative, the present Union Department of Animal Husbandry and Dairying may be renamed as Department of Animal Husbandry' Dairying and Fisheries with a strengthened division to promote fisheries development.

2) Fisheries graduates should be given preference for jobs by the State Fisheries Departments.

3) The fisheries sector is denied loans for commercial development of fisheries by the banking sector. Considering this, Government should take immediate initiatives to ensure that the commercial fisheries sector is made eligible for loans from commercial banks.

4) Equal status should be given to aquaculture at par with poultry and dairying.

5) Extension education methodology should be refined to facilitate transfer of extension technologies to the grass root level with speed and thoroughness.

6) A Technology Development Fund for the development of fisheries technology should be set up.

7) Fisheries students should be considered for granting of fishery leases of tanks, ponds and reservoirs.

8) Specific strategies are to be formulated for enhancing fish production including intensification and diversification of culture system and stock management in both large waterspreads and seas.

9) Appreciating the role of fish in domestic nutritional security, particu- ☞

larly in rural areas, coupled with high possibility of poverty alleviation, integrating fish and aquaculture with other farming systems for achieving sustainability should be promoted.

10) Considering the increasing pressure on fish as a human food and resultant scarcity of fish meal as an ingredient, it has become imperative for countries to search for an alternative organic source of raw material. In this context, all efforts should be made to identify such a resource that will be viable.

11) Technologies for manufacturing feeds to meet specific requirements of different types of fishes may be developed, in order to reduce feed wastage in aquaculture system.

12) Greater emphasis is needed on introduction of non-conventional candidate species in different environments with special emphasis on their breeding and larval culture.

13) Value addition and diversification in processed fish products for greater returns and nutrition should be promoted with a greater sense of urgency.

14) Evaluation of fish and shellfish products as a source of other nutritional components needs to be undertaken.

8) Networking and collaboration between various national and international institutions in research and development has to be accomplished.

9) Transfer of technology and need-based modifications in package of practices, and assessment database of other countries for exchange purposes deserves focal attention.

10) Financial investment in R&D process related to fisheries of Asian countries, considering their contribution to the export earnings and the domestic food security, needs to be mobilised.

Backyard Eel Culture

Backyard eel culture is economically viable compared to other small-scale fish culture enterprises. Eels can be cultured with higher stocking density and nominal feed cost, according to Dr.S.S.Tabrez Nasar, aquaculture specialist, International Institute of Rural Reconstruction, Philippines, as reported in *The Hindu*, 7 February 2002.

Freshwater species, *Anguilla* (swamp eels) and *Monopterus* (the rice field eel) are most desirable for backyard eel culture. These eels being quiet resistant to pollutants can be grown in tanks, dugout polyethylene lined ponds and aquatic crops. A stocking density of 0.5 to 1.0 kg of young *Anguilla* containing 3,000 to 6,000 elvers (baby eels) per cubic metre of water is considered ideal, according to Tabrez Nasar.

Culture of wild species (length 12 to 15 cm) would yield harvestable size (250 g) in 8 to 9 months compared to normal culture period of 12 to 18 months. Adequate care should be taken for the oxygen content and feed supply in the culture media, it is cautioned.

It is stated that cannibalism is prevalent among *Monopterus* sp. and that feed control is an important factor for eels to register a sizeable growth. At fingerling stage, they can be fed with aquatic insects found in stagnant water bodies (ponds). The feed can be supplemented by small earthworms produced by vermi-nursery for feeding the young eels. The adult ones and known to feed voraciously on fish fingerlings, earthworms, snails, aquatic insects, silkworm pupa, slaughter house wastes and other organic residues. Eels also feed on golden snails and tilipia, controlling their population.

Harvesting can be carried out partially or completely. As live eels will yield a better price, utmost care is to be taken during harvesting. They can be transported live in holding tanks, net cages or baskets to the market yard.

Neospark's Technical Seminar on Water Bio-Remediation

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trite were toxic to the aquatic organisms they would have to be detoxified by converting them into non-toxic nitrate and then to nitrogen gas. He explained that, nitrate acted as a fertiliser for the growth of phytoplankton and nitrogen gas would get expelled out of the pond. Explaining the process further, Rao said that conversion of ammonia and nitrite to nitrate was carried out through a process called nitrification and that the specific bacteria required for this process were called nitrifying bacteria. Pointing out that these nitrifying bacteria included *Nitrosomonas* sp. and *Nitrobacter* sp., he said that these would not generally occur in the needed quantities in ponds. There was thus a need to create conditions for the multiplication of these bacteria. In this context, he said that Neospark came up with the product ***Bio Remid-Aqua***. This contained specially selected strains of these nitrifying bacteria along with other natural probiotic strains of *Bacillus* sp., *Aerobacter* sp., and *Cellulomonas* sp., he said. ***BioRemid-Aqua*** also contained biochemical accelerators and enzymes like Proteases, Amylase, Lipase, Hemicellulase and Lactase, he added. It was pointed out the major role of *Bacillus* sp. included mineralisation of carbon, breakage of proteins by producing enzymes and co-enzymes. It was explained that by this process *Bacillus* sp. accelerated the organic waste decomposition.

Continuing, Rao said that the addition of these different bacterial strains in to a pond increased the favourable microbial diversity for achieving better production results. Pointing out that *Bacillus* sp. were gram-positive, rod shaped, aerotolerant or anaerobic and were commonly found in marine sediments, he said that these were active antagonistic competitors to pathogenic bacteria for food and shelter. It was clarified that the population of these microbes in aquaculture ponds was capable of displacing pathogenic and deleterious common bacteria like *Vibrio* sp. One aspect he mentioned was that Luminous Vibrios could be eliminated from the water column and from the sediment of the ponds by these microbes.

The probiotic bacteria which would develop as a result of the application of ***BioRemid-Aqua*** would have the affect of producing antibiotics like Bacitracin and Polymyxin that would inhibit the spread of *Vibrio* sp., and would also increase their mortality rate, while at the same time promoting the dominance of probiotic *Bacillus* sp. He wanted the participants to note that while vibrios secreted large amounts of slime to hold more organic matter to serve as their food, probiotic bacteria such as *Bacillus* sp., produced exo-enzymes, which would break down this slime, and also utilise the organic matter and make the nutrients unavailable to the growing vibrios. In other words, he said that, the *Bacillus* sp. would compete with food of vibrios resulting in their elimination. This would lead to improvement in water quality through more rapid degradation of waste organic matter. Rao said that the probiotic strains of *Aerobacter* sp. and *Cellulomonas* sp. would also enhance the process of biodegradation and would replace the pathogenic bacterial forms through antagonism. The enzymes of ***BioRemid-Aqua*** were specific in digesting the organic waste matter in the pond water. Concluding his presentation, the specialist said that ***BioRemid-Aqua*** contained only the safest, natural and environmentally isolated probiotic strains. The naturally selected and isolated strains available in ***BioRemid-Aqua***, due to their fast and maximum biodegradation capabilities of waste organic matter, would restore the health of the pond bottom for the next crop and hence would promote sustainable aquaculture development. The following broad levels of applications of ***BioRemid-Aqua*** *vs* stocking density per sq.m were suggested by Rao.

Shrimp Culture Period	*Upto 5 PCS/M² Quantity per Hectare*	*5 to 10 PCS/M² Quantity per Hectare*	*10 to 20 PCS/M² Quantity per Hectare*
3 to 5 days before stocking	200 gm	300 gm	350 gm
15 days after stocking	250 gm	350 gm	600 gm
30 days after stocking	300 gm	500 gm	850 gm
45 days after stocking	350 gm	650 gm	1000 gm
60 days after stocking	450 gm	700 gm	1150 gm
75 days after stocking	500 gm	850 gm	1600 gm
90 days after stocking	550 gm	1150 gm	1900 gm
105 days after stocking	550 gm	1200 gm	2100 gm
120 days after stocking	500 gm	1250 gm	2150 gm
Total	**3650 gm**	**6950 gm**	**117000 gm**

Mr. D.S.V.S.Raju (Mani Raju), Secretary, Aquaculture Farmers Association, East Godavari District, spoke on the problems of aqua farmers of East Godavari District and the current situation of shrimp aquaculture in the district. He conveyed the gratitude of the farmers to Neospark for developing and launching an intimately useful probiotic product under the name ***BioRemid-Aqua*** for the benefit of the farmers. He expressed the hope that the product would go a long way in reducing the white spot disease among cultured shrimps. His special thanks on behalf of the participating farmers went to Mr. G. Chandrasekhar, Director of Neospark for explaining in great detail the range of products available with Neospark for supply to the farmers for ensuring congenial culture conditions and producing healthy sustainable shrimp crops. He profusely thanked Prof. K. Gopala Rao and Dr. A.V.Rao for explaining about water probiotics and the new product ***BioRemid-Aqua***. The function came to a close with a vote of thanks proposed by Mr. G.N.V. S.S.Ram Babu, Area Sales Manager of the company and Mr. C. Srinivas Rao, Area Sale Officer.

World Seafood Market Conference

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pean Seafood Retailing'. One major change that came about over years was in the fish retailing pattern, he said. From the hands of fish mongers, retail business had moved into the lap of large supermarkets and the same trend was seen all over Europe, he explained. It was pointed out that European customers were looking more and more for convenience foods, adding that in UK and northern Europe, housewifes were no longer conversant with handling raw fish to prepare them for cooking. Further, they were no longer having time or the inclination to pass through a long preparatory routine.

The editor-in-chief said that demand in the European retail and catering trade had grown significantly for processed cuts (steaks and fillets) and portion controlled packs. Sale of chilled fish and shellfish in controlled atmosphere packs (CAP) had not become common in supermarkets all over Europe. In CAP carbon dioxide, nitrogen and oxygen was used in different ratios but of these carbon dioxide acted as a preservative, he explained. Seafood had been reduced for greater convenience for use in ready-to-cook form. He added that chilled product consumption was strongly linked to microwave ownership.

Peter RedMayne, President, Seafare Group told vietnamese delegates : "Over the years, I have also done a lot of seafood market research and development, including development of marketing materials, so I may be able to help your industry in that regard. I am very interested in helping VASEP out, as I believe your products have considerable market potential in both China and the U.S, if they are sold with the help of a well thought out marketing strategy. As you know, prices for many seafoods are very low right now, so strong market positioning is the key to profitability."

As part of his presentation, Herby Neubacher, Editor-in-Chief, *FischBeuro*, observed..."Poisoned shrimps from Asia" were the headlines of some leading newspapers in Europe. Nearly every week a negative programme is shown on TV about the procedure of farming shrimps in Asia. This is causing serious problems in the selling and exporting shrimps to Europe, as European Commission is ready to take action against products containing antibiotics in a certain volume.

Herby Neubacher posed the questions.... "How is it possible to keep market share and consumers to Vietnamese shrimps in spite of the problems in communication? What can be the way to brand the products and to know what is valuable to the European consumer when it comes to preference of Vietnamese product?".

Song Shuyi, President, China Kingdom Import Export Company said that Chinese markets had increasingly shown their potential power against Vietnam seaproducts. Especially, the joining of China to WTO would create a lot of opportunities in international trade. Vietnam was the most advanced partner which shared their border, culture, language and the traditional way in doing business with China.

The presentations made by Mr. Katsuhiko Shimizu, Mr. Mike Urch and the other chief guests rendered the conference lively. There were social events and active business contacts. The conference projected an impression of Vietnam as an important and up-and-coming producer and exporter of aqua products.

Mr. Y.Surya Rao, President, Sea Food Exporters Association of India, A.P. region, availed of the opportunity of visiting Vietnam and being at Vietfish 2002 to study the approach and strategy of Vietnamese industry in promoting aquaproduction, both culture and capture and achieving exports of aquaproducts, particularly value-added one, on a zooming scale in a short span of over a decade.

Contacted, Mr. Surya Rao, Indian delegate at the Conference later said that the aquaculture sector of Vietnam had proved to be the driving force behind Vietnam's booming seafood export industry. It was mentioned that Vietnamese aquaculture exports of 2.2 million t earned US $ 1.8 billion last year. This represented an increase of 15 per cent over performance in 1999. According to Suryarao, the growth had been due to heavy investment towards importing advanced processing technologies and enhancing food safety management. Shrimp and freshwater fish species constituted the main components of the export, he mentioned.

He referred to a statement by the Vietnamese Fisheries Ministry pointing out that Vietnamese marine exporters had put in place an appropriate infrastructure to cope with global market requirements. Surya Rao further mentioned that there was a growth in the number of Vietnamese businesses that had qualified for export licences to transport seafood products out of the country. 61 of them were now allowed to ship directly to the European Union alone.

According to him, Vietnam exported more than US $400 million worth of seafood to the United States last year. Japan accounted for 26 per cent with China and Hong Kong together importing 20 per cent of Vietnam's seafood exports. He observed that one recent development in Vietnam had been the emergence of the private sector enterprises as crucial players in seafood production and export.

Vizag Court turns down State Bank's Plea

The State Bank of India, Agricultural Development Branch, Visakhapatnam filed a case (O.S.No.51/94) against some of the Directors of Intersea Marine Foods for the recovery of Rs.3,26,810/- due to the Bank. The loan taken was Rs.15,72,000 for acquiring a boat and before the repayments could commence, the vessel was caught in a fire accident and the insurance company paid the amount to the State Bank. After taking interest-based dues on quarterly/half yearly payment, State Bank demanded a balance of payment due worked out to be Rs.3,26,810/-. The defendents argued that the basis of calculation of interest made by the Bank was against certain earlier judgements and pleaded for dismissal of the case, obviously because the title deeds of their Banks, pledged to the Bank were held up there. The Principal Senior Civil Judge, Visakhapatnam in his judgement date 18 April 2001 dismissed the case, supported by several legal reasons, and directined the parties to bear their own costs.

Orissa Newsletter

From **H.S. Badapanda**

International Workshop on Restoration of Chilika Lagoon

An International Workshop on 'Restoration of Chilika Lagoon' was held at 'Hotel 'The Marion' Bhubaneswar from 18-20 January 2002. The main objective of the Workshop was to create awareness towards protection of the lagoon's ecosystem and to provide a much needed platform for achieving the objectives like: (a) To identify the emerging issues on the biodiversity and conservation of Chilika lagoon, (b) to formulate guidelines for restoration and conservation of the lagoon, (c) to formulate a strategy to enhance the participation of local community for the conservation and prevention of misuse of the lagoon's resources, and d) to formulate strategies for ecotourism development.

A large number of National and International experts were present and worked on the review of present status and future prospects on the development of the Chilika lagoon. A report on the Workshop will be published in one of the forth coming issues of *Fishing Chimes*.

Cabinet Decision on Chilika Fishery

The Orissa Cabinet has decided to impose a ban on the culture practices in Chilika lagoon. A draft on the new Act has been approved in the meeting. The Chief Minister of Orissa presided over the meeting where Mr.D.P.Bagchi, Chief Secretary to the Government said that no fishing would be allowed within the limit of 1,000 mt from the shore line nor any culture practices would also be allowed within it. He said that *Ghery* culture would also be totally banned and that the traditional practices of fishing only would be allowed. An area of 47,000 ha would be leased out for fishing to 'FISHFED', out of which 33,000 ha would be leased out to primary fishermen's co-op societies and the balance 14,000 ha would be leased out to others. FISHFED will sub-lease the area to Primary Societies and to others who will abide by conditions as laid down by the authority concerned. But the final decision would be vested with 'FISHFED' which may renew the lease as and when required. The Chilika Development Authority (CDA) would supervise the process and an expert committee would be formed as stipulated by the Chief Secretary. The Department of Revenue, Fisheries, Forest and other officials would be associated with the process and in case of need, police protection would be provided. The CDA would take care of the environment and see that the ghery are totally demolished. The Chief Secretary indicated that criminal proceedings would be initiated against those who will conduct fishing in the lake without permission. The Bill has been named a "Chilika Fish, Lease In Chilika Regulation Bill, 2001".

In the meantime, a large number of fishermen from the peripheral villages of the lake assembled in the capital and vehemently opposed the bill. They demanded that the fishing rights of the lake should be handed over to the traditional fishermen and they threatened severe turmoil if this is not done. The Fishermen's Federation organised this rally and demanded that, as they had the right of fishing in the wetland since time immemorial, the Bill has no justification to snatch their right. They discussed their problem with the Speaker of the Assembly in his chamber. The federation has submitted a 20 point demand to Government to review the lease policy mainly on ban of culture practices in the lake, ban on shrimp seed collection, on handing over the Kalijai Trust to the federation, steps for protection of environment and as and when required for development of the lake.

Chilika Mouth Opening to Enhance Fish Producton

The Forest and Environment Minister, Govt. of Orissa, has said that after opening of a new mouth 8 km away from Satpada the production of fish and prawn in the lake has significantly increased. The Minister, Mr.A.P.Singh was replying to a question put by the MLA, Mr.Pradipta Panda. He said that though the new mouth had been opened the old mouth at Arakhkuda was still in operation. He indicated that the annual fish production from the lake was around 1,600 mt. from 1994-'95 to 1999-2000 but in 2000-'01 (Oct.2000 to March 2001) it has been around 3,500 mt. From April 2001 to November 2001, the catch had gone upto 7,600 mt. He also said that all efforts were being emphasised by Govt. to protect dolphins seen at Satpada and in outer channel of Chilika.

Fish Culture in Capital's Tanks

It is understood that CIFA has evolved a plan to bring big and small freshwater tanks/reservoirs inside the city of Bhubaneswar under fish culture for which an amount of Rs.10 crores has been budgeted. This step would protect the waterbodies from pollution and would also augment income. The services of NGOs has also been sought for funding as well as improvement of these tanks/reservoirs. It is said that similar steps taken in some other cities of the country have given good results.

Shrimp News

1) Information from Paradeep and Kujang reveals that berried shrimp females and shrimp juveniles in large quantities are being caught and despatched to places outside at higher prices. Though there are restrictions to prevent such collections, the activity has not been checked due to reasons not so far known. The despatching is mainly done during night hours by taxis, cars and even in mini trucks and vans. There is a general demand for checking this to protect environmental interest as well as progress for future propagation of the invaluable

shrimp species like *Penaeus monodon* and *P.indicus*.

2) The unauthorised prawn *gherys* constructed at Gupti, Baluagapatia, Devnaranjanpur have been demolished by the Forest Department. The demolition was done in the presence of Tahasildar, Rajnagar with the Officer-in-charge, Rajnagar P.S. Due to demolition, large quantities of prawn juveniles are said to have entered into the creek. These demolitions have been done as the *gherys* were developed inside forest area violating CRZ provisions.

Similarly, *gherys* near Satpada and Gambhari have been demolished with the help of Puri district administration.

Lease of Fishery resented

Severe objections from the people residing at Gram Panchayats of Jagatsinghpur district namely Baramundali, Naharana, Anantpur and Kusapur have been raised due to granting of lease of Maldiha Fishery and Sanghua Fishery at a nominal price of Rs.4,500/- by Tahsildar, Balikuda. They have doubts that there may be a nexus behind this. Due to objections from public this fishery could not be leased out during 1998-'99 and 1999-2000. But during 2000-'01 the lease was given which had led to the resentment. An appeal has been sent to the Collector, Jagatsinghpur, for cancelling the lease but no action has been taken as yet.

The MLA of Balikuda, Mr. U.C.Swain has also approached the Collector for action. It is feared that if the lease is not cancelled, there can be further agitation.

G.N.Mitra Honoured

Dr. G.N.Mitra, the *Bhisma Pitamah* of Indian Fisheries was honoured in a colourful ceremony held in the historic *Saheed Bhawan* at Cuttack on 2 February 2002.

On this memorable occasion a 'Fisheries Meet' was sponsored by an NGO 'IMPRESS' in association with the Department of Fisheries, Orissa. Mr. S.N. Sarangi, IAS, Additional Secretary to Govt., Fisheries and ARD Dept. presided over the function. Mr. B.Harichandan, Minister, Revenue and Law, Animal Resources Dept. & Fisheries, was the Chief Guest. Mr. J.Panda, IAS, RDC (CD) Cuttack and Ex-Director of Fisheries, Orissa; Mr.Satyabrata Sahu, IAS Director of Fisheries, Orissa; Dr.G.N.Mitra, the founder Director of Fisheries, Orissa attended the function as guests of honour. At the beginning the Hon'ble Minister lighted a lamp and declared the meet opened. Before that Mr.Pradeep Pattnaik of 'IMPRESS' welcomed the guests and introduced them to the audience. Almost all retired officers of the Dept. of fisheries were invited to attend the meet among whom there were previous Directors of Fisheries namely Mr.P.Mohapatra, Mr. M.K. Ahmed, Mr.H.S.Badapanda and Mr. Sk. Md.Jamil Ahmed.

At the outset of the function, a citation embossed on a copper plate was read with deep reverence by Mr. H.S. Badapanda in honour of Dr.G.N.Mitra and it was handed over to him by the Minister Mr.B.Harichandan. The recitation recalled the humble service rendered by Dr.Mitra for the development of Orissa Fisheries and his significant contribution to the Indian fisheries as a whole; his service in international bodies like FAO, UNESCO, Asian Development Bank were also remembered. The Department of Fisheries, Orissa with its devoted working and retired staff paid their utmost respect and gratitude to this grand old genius and prayed for his long life.

Mr. Pradeep Pattnaik of 'IMPRESS' said that the time had come to devise plan and programme for development of status and economics of the 15 lakh fishermen residing in the State and utilisation of the vast water resources of inland, brackishwater and marine belt to increase fish/shrimp production.

Dr. G.N.Mitra in his reply to the citation remembered the good old days when no modern facilities for development were available but the staff had to work with much hardship. He recalled how trawl fishing in coastal waters and boat fishing in Hirakud reservoirs were introduced and how fishing techniques were popularised long 40-50 years back. He said that the dynamic ex-Chief Secretary Mr.Sivaraman and all others were helpful to him in his endeavour. He desired that more attention was required for Chilika development, utilisation of all fisheries resources for increasing production and economic earnings by a regulated marketing system. Moreover, he emphasised on resource based production and for transfer of technology to field oriented business for profitable utilisation of the resources.

Mr. J.Panda, Ex-Director, recalled his two years of service in the Department and said that more regulated steps were needed for all out development of fisheries in years to come. Mr. S.Sahu, Director said that action plan had been drafted for fisheries development and greater stress was being given for its implementation in the 10th five year plan. Mr. B.Harichandan, Minister for Fisheries said that fishery development in the State had been taken up as a mission and he would follow the foot steps of a genius like Dr.Mitra to bring the missionary zeal into action. He indicated that steps were being taken for regulation of water pollution, reservoir development and Chilika development etc. He highly appreciated the contribution made by personalities like Dr. G.N.Mitra and he would promote fishery development with calculated action plan.

At the end, some prizes were given to persons for their successful contribution in the field of extension, publicity, journalism, public service and pisciculture. The vote of thanks was proposed by Mr.T.Behera, Jt. Director of Fisheries, Orissa.

A Technical session on the Freshwater Prawn culture was held under the Chairmanship of Dr.G.N.Mitra. The Rapporteurs were Mr.Jamil Ahmed and Mr. S.K.Mohanty. Dr.Kanujia of CIFA, Mr.K.Ahmed, Director of Fisheries, Orissa (Retd.) and Mr. H.S. Badapanda, Dy.Director of Fisheries (Retd.) were the

resource persons. At the outset, Dr.Kanujia gave an overview of the technical development of freshwater prawn culture in the State of Orissa. Mr.Jamil Ahmed also narrated his experiences in freshwater prawn culture. The fish/prawn culturists who were attending the workshop put forth their problems relating to mortality during transit, less growth in village ponds, non-availability of prawn juveniles in time for stocking, problem of harvesting in a composite culture tank, marketing etc. Dr.Kanujia of CIFA and Mr. S.K. Mohanty, Joint Director of Fisheries (Retd.) replied to the queries of the farmers. In the end, the Chairperson advised to follow the technical procedures with sincerity to achieve profitable harvests. Mr.H.S.Badapanda proposed a vote of thanks on behalf of the retired persons attending the meet and assured full co-operation to the Dept. whenever their services were needed in future. Mr.T.Behera also proposed a vote of thanks to all others attending the meet.

Chilika would Survive and Stay

An International Workshop was held from 18-20 January 2002 on "Restoration of CHILIKA lagoon" at hotel 'The Marion', Bhubaneswar. It was attended by various wet-land experts, scientists, environmentalists, administrators. It was organised by the Chilika Development Authority (CDA). It was indicated that in 1980 there was fear that the wetland was heading towards a swampy status, was on the process of dying and was listed in the *Ramsan* list. But now the situation had totally changed after a new mouth was opened away 7 km from Satpada and the wetland was joined directly with Bay of Bengal. This changed situation had added to the eco-restoration of the lagoon to a great extent. The fish/prawn production had multiplied, the salinity of the lagoon water had increased and special attention had been given to increase anthropogenic pressure and restoration of economic status of about 1 lakh fishermen residing on its peripheral villages. The Chief Secretary, Govt. of Orissa, Mr.D.P.Bagchi inaugurated the meet and it was attended by Dr.Trisal, Director, Wetland International, New Delhi, Mr. A.Sarangi, Principal Secretary to Govt., Forest and Environment Dept. A.K.Pattnaik, Chief Executive, CDA with national and international expertise. Valuable recommendations were proposed for eco-restoration and all-out development of the lagoon. A separate report on the workshop would be published in *Fishing Chimes* soon.

Emphasis for Utilisation of Water Resources for Fish Production

State level Symposium "Orissa's Blue Revolution: Prospects in the New Millenium" was held at Salipur College campus. It was emphasised on the occasion to put the water resources available to full utilisation and increase fish production in a bigway. Mr.A.K.Baisnab, Collector and District Magistrate, Cuttack, presided. Mr.P.C.Mishra, Commissioner-cum-Secretary to Govt., Higher Education said that the students should be self-generating themselves for livelihood by acquiring applied technical know-how. Among such items the blue revolution was one, he added.

Dr. Rebati Ch. Das said that self-sufficiency in production-oriented profession was the only solution to solve large scale unemployment. Dr. S.Mishra introduced the guests while Dr.S.N.Chinara welcomed them. The symposium was attended by more than sixty educationalists, researchers and experts.

Fear of Extinction of Sharks and Shrimps

A fear psychosis has manifested itself that in near future the availability of sharks and shrimps from the coastal belt of Orissa would become scaresdue to the fact that hundreds of sharks and brood shrimps are being caught daily. The big sharks are transported to markets like Mumbai and Calcutta daily from the coast whereas the samller ones are dried for local sale. Further, the brood shrimps are caught mostly off Paradeep and Gopalpur coast and despatched to West Bengal and Andhra Pradesh for hatchery purposes. Though there is a regulation to ban such catches, no effective steps are initiated at administrative level. It has been appealed to stop such unregulated catches to protect both the species from extinction.

Trawler Seized off Gopalpur Coast

During the night hours of 7 February 2002 an Andhra Trawler operating off Gopalpur coast was seized with 8 crew members. The crew were from a coastal village near Visakhapatnam. Mr. B.B.Sahu seized the trawler on the direction of Mr.S.Sahu, Director of Fisheries, Orissa. It is learnt that action is being taken against such unauthorised fishing under OMFRA.

News in Brief

(I) **B.B. Das Expired** : Mr.Banka Bihari Das, the noted environmentalist, Orissa, died in August, 2001. He will be remembered for his immense contribution to protect environment and he was one of the pioneers in the country who helped to make the CRZ Act into a reality. He was a Gandhian, a freedom fighter, public leader and a dear friend of a large number of cultivators. He will be remembered as a strict disciplinarian, an honest politician and as an able administrator.

(ii) **Transfer and Posting**: Mr. A.K. Tripathy, IAS has joined as the Commissioner-cum-Secretary to Govt., ARD Dept., Orissa. Mr.Satyabrata Sahu has joined as Director of Fisheries, Orissa in place of Mr. G.K.Dhal.

(iii) **Strike to fill vacant posts** : The staff of Directorate of Fisheries, Cuttack, are on strike since 1st week of December, 2001 protesting against the non-action of the Directorate to fill up vacant posts. They allege that no proper action is taken to fill up posts such as Planning Officer, Junior Planning Officer, Seminar Record Keeper, Mechanical foreman etc., since long. With black badges on their dresses, employees are continuing the strike. It is expected that the Director would sympathise with the demand and neutralise the discontentment.

MARKET TRENDS

The Indian seafood export scenario, particularly related to Japan is gloomy, with both producers and exporters eagerly longing for an improvement in the position. In this background, *Seafood International* (March 2002 issue) has presented the following forecast in respect of global shrimp market :

"The market has picked up again after the September 11 incident. but other incidents have created some turbulence.

In January, the EU banned imports of certain animal products from China including shrimp and, as China has once again become a large producer and exporter of farmed shrimp, this has affected the market. Although wild caught shrimp are also banned, it is farmed products that are in focus and unless the situation is resolved quickly the effects may be more serious.

Other producers are, of course, benefiting from China's misery. Thailand has been aggressive in promoting its shrimp both to the EU and the USA. India and Indonesia are also coming into focus as European buyers turn to these nations for replacement supplies.

Prices are increasing, partly as a result of this situation and partly because of the usual post-Chritmas effect of slackening demand.

In the USA, imports were high towards the end of the year. Thailand was by far the biggest supplier, followed by India, Vietnam and Ecuador.

There is a certain optimism in ths US market again and this is reflected in slightly growing demand and somewhat better prices. This, coupled with the 'China situation' and the resulting changes in the supply structure, will continue to push up prices moderately.

In Japan, we also expect the market to become firmer in spite of the recession. Demand should pick up in March and April. In general, we are moderately optimistic." It is to be hoped that the above quoted optimistic assessment will soon be reflected vis-a-vis India too.

The following are the rates that prevailed in the week ending 21 Feb. 2002.

Item	*Count range*	*Price range($/kg)*
JAPAN		
HL BLACK TIGER		
Bhubaneswar	11/15 - 51/60	16.80 - 6.50
Chennai	11/15 - 31/35	15.50 - 8.70
Kolkata	8/12 - 41/50	17.20 - 6.50
Mumbai	8/12 - 41/50	17.80 - 7.80
Visakhapatnam	8/12 - 36/40	20.00 - 7.70
HL SEA TIGER		
Bhubaneswar	U/5 - 16/20	20.80 - 9.80
Visakhapatnam	U/5 - 36/40	21.50 - 6.00
HL WHITE		
Bhubaneswar	8/12 - 26/30	17.90 - 8.80
Mumbai	8/12 - 51/60	19.00 - 5.60
Visakhapatnam	8/12 - 91/110	18.00 - 3.00
HL FLOWER		
Mumbai	6/8 - 36/40	17.80 - 6.30
Tuticorin	6/8 - 61/70	18.25 - 4.10
Visakhapatnam	6/8 - 36/40	17.00 - 5.50
HL BROWN / PINK		
Mangalore	11/15 - 51/60	9.50 - 4.00
Visakhapatnam	21/25 - 51/60	7.35 - 4.95
PUD		
Bhubaneswar	10/20 - Broken	8.00 - 1.65
Kochi	300/500 - Broken	3.00 - 2.80
Kolkata	80/120 - Broken	5.20 - 2.00
Mangalore	200/300	3.40
Mumbai	U/20 - Broken	8.50 - 1.70
Tuticorin	10/20 - Broken	9.00 - 1.50
Visakhapatnam	U/20 - Broken	8.00 - 1.85
LOBSTER (Whole cleaned)		
Mumbai	U/80 - 500/UP	5.60 - 8.25
SURIMI (Yen)	AA Grade	190
	A Grade	160
	B Grade	140
USA/CANADA		
HL BLACK TIGER (lb)		
Visakhapatnam	8/12 - 31/40	8.25 - 3.95
HL SCAMPI (lb)		
Chennai	6/8 - 26/30	6.50 - 2.70
HEAD ON SCAMPI		
Chennai	2/4 - 6/8	3.05 - 2.35
Kochi	10/20 - 20/40	1.20
BLACK TIGER		
Bhubaneswar	16/20 - 51/60	12.20 - 6.40
PD SHRIMP	130/200 - 300/500	3.20 - 1.40
PUD SHRIMP		
Kochi	300/500 - 250/350	3.00 - 2.65
CUTTLE FISH (WC)		
Kochi	U/1 - 1/2	3.00
Tuticorin	U/1	1.15
SQUID (WC)		
Kochi	3/5 - 6/10	1.95 - 2.35
Mangalore	U/5 - 20/40	1.12 - 0.85
Tube	U/10 - 60/80	1.50 - 0.75
SURIMI	B Grade	1.15
EUROPE		
HL BLACK TIGER		
France	21/25 - 51/60	11.00 - 7.00
UK	11/15 - 41/50	16.20 - 7.70
HL WHITE		
UK	21/25 - 41/50	10.20 - 6.30
HL BROWN		
UK	21/25 - 41/50	7.80 - 5.10
PUD		
Netherlands	60/80 - 500/800	5.90 - 2.00
UK	40/60 - Broken	5.50 - 1.40
SQUID		
Spain (Whole cleaned)	U/3 - 6/10	2.30 - 1.80
Italy (Whole)	U/3 - 3/6	2.30 - 2.10
France (Tentacles)	60/UP	1.50
France (Rings)	60/UP - Broken	2.50 - 1.50
CUTTLE FISH		
Spain (Whole cleaned)	U/1	2.30
Spain (W)	2/4 - 13/20	3.20 - 2.15
SOUTH EAST ASIA & CHINA		
HL BLACK TIGER		
China	41/50 - 91/110	7.00 - 3.40
FISH		
a) Silver Pomfret		
Mumbai	300/400 - 500/600	4.00 - 6.00
b) Ribbon fish		
China	100/200 - 700/UP	0.47 - 0.78
c) Mackerel		
Malaysia	2/4 - 10/12	0.95 - 0.80
CUT CRAB		
Korea	3L - Claws	3.40 - 0.80
SHARK FINS		
Hong Kong	Black fins	58.00
	White 14" Up	155.00
	White duplicate	80.00
MIDDLE EAST AND OTHERS		
PUD		
UAE	U/20 - Broken	9.00 - 1.70
PD		
Australia (Tail on)	16/20 - 26/30	11.50 - 8.50
Australia	26/30 - 41/50	8.60 - 6.70
UAE	100/200 - Broken	3.00 - 1.85

(Source: *Seafood International and Prime of MPEDA*)

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Adoption of sub-surface Longlining by small artisanal vessels off the north-east coast of Brazil

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Artisanal fishing communities along the north-east of Brazil heavily rely on inshore stocks of several commercially important species. Most fishing occurs within 20 kilometres of the coast and involves handlines, traps and gillnets set from small wooden vessels (six to twelve metres in length) powered by three-cylinder diesel motors. The main target species include fish, such as snappers, *Lutjanus* spp., weakfish, *Cynoscion* spp., groupers, *Mycteroperca* spp., and more commonly, lobsters (*Panulirus argus* and *P. laevicauda*).

Minimum regulation of fishing effort has meant that most stocks currently are exploited well beyond sustainable levels. Catches have severely declined over the past 25 years and this has resulted in quite severe social and economic conditions for many fishing communities. In response to decreasing returns, during the mid 1980s some operators began to investigate alternative fishing methods and in particular, of Japanese-style, multifilament, sub-surface longlines to target stocks of oceanic groups of species such as tunas (scombridae), sharks (Carcharhinidae) and billfishes (istiophoridae and xiphiidae).

Sub-surface longlines are considered passive fishing gears, relying on the chemical and visual stimuli of bait and other attractants to direct targeted species to the hooks. In contrast to several other fishing methods, longlines are considered relatively efficient at selecting those individuals that are targeted, whilst avoiding large quantities of incidental catch. As with most fishing methods, however, their effectiveness and selectivity are determined by several key factors. These include: a) Vertical distribution of hooks in relation to maximum abundance of target species; b) Type and size of hooks and their spacing along the mainline; c) Setting methods; e) Time and direction of set; f) Soak duration; and most importantly; g) The stimuli associated with bait.

The integration of these various factors has meant that to maintain commercially viable catch rates off north-eastern Brazil, vessels longer than 18 metres have been required to set numerous hooks (eg.> 1,200) spaced over substantial distances (eg.40 kilometres of multifilament mainline). The logistics associated with operating this amount of gear has prevented the adoption of sub-surface longlines by smaller (eight to twelve metre), more commonly-used artisanal vessels.

Between 1983 and 1996 upto 10 large longliners, including several leased foreign vessels operated off the coast of north-eastern Brazil and throughout the adjacent south-eastern Atlantic Ocean. While the targeted species varied among sharks, billfishes and tunas during this period, few advancements in the types of gear used meant that total catch per unit of effort (CPUE = number of fish caught per 100 hooks per day) remained fairly stable at about 2.4.

During 1997, however, several technological developments, such as monofilament mainlines, chemical lightsticks (designed to increase attraction to hooks), improved hook design and different types of bait were introduced. These gear changes dramatically improved the CPUE of many species and particularly swordfish, *Xiphias gladius*.

The effectiveness of these relatively

Fig 1 : A small, recently converted artisanal longliner

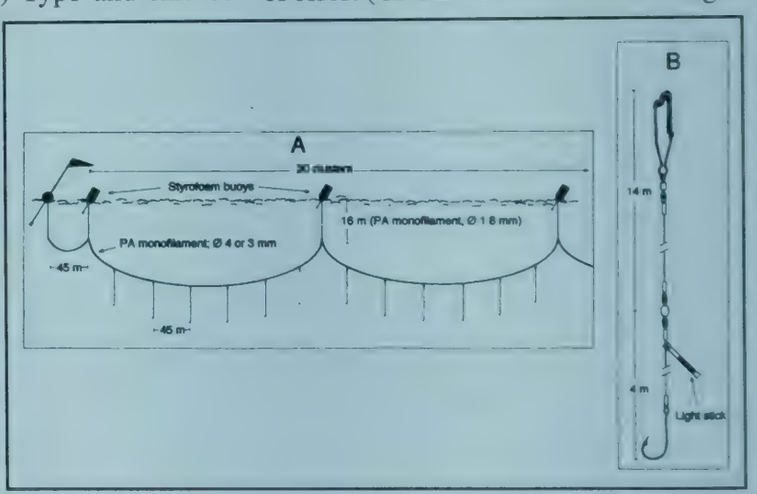

Fig 2 : Diagrammatic representation of: A) configurations of sub-surface longlines and B) Secondary lines used in the experiments to assess the effects of type and orientation of baits on catches

new configurations of sub-surface longlines means that profitable catches can be maintained using fewer hooks set over shorter mainlines. Such reductions in gear may facilitate the adoption of this type of fishing method by small artisanal vessels. The potential for their involvement in this fishery, via a re-distribution of fishing effort away from some larger vessels, has been encouraged by local governments, because it may provide an alternative to existing subsistence-based fisheries.

The authors recently completed a preliminary study assessing the feasibility of such a transfer of technology. This was done by comparing the relative catch rates of a converted artisanal vessel (11 metres in length and using approximately 300 hooks set along a 20 kilometre mainline) against those from a large leased vessel (24 metres in length and using 1,200 hooks set along a 40 kilometre mainline).

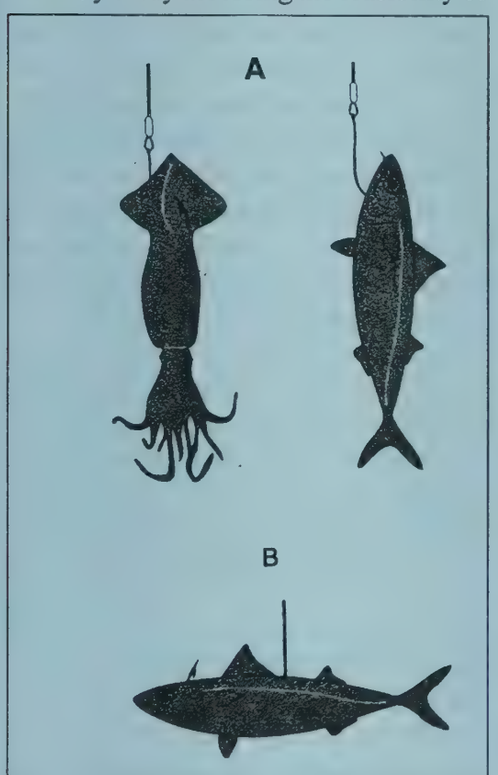

Fig 3: Attachment of : A) vertically orientated squid and mackerel and B) horizontally oriented mackerel to hooks in the experiments assessing the effects of type and orientated of baits on catches

Both longliners fished a similar number of days during the same period (nine months between 1997 and 1998) but in different areas: the operations of artisanal vessel was limited to 100 kilometres from land, while the leased vessel fished out to 500 kilometres.

The results showed that there were significant differences between vessels for the catches of some species, contributing to a lower total CPUE by the artisanal longliner (3.8 versus 5.2). However, the relative abundance of commercially important species within the operational range of the smaller vessel was more than sufficient for economically viable fishing. The net financial return per hook set was similar to the larger, leased vessel and the total income almost 10 times greater than that derived from traditional fishing methods during the same period.

The work described above provided evidence to suggest that small longliners can achieve commercially viable catch rates and the authors subsequently adapted several vessels (eight to 10 metres in length to accommodate the equipment required for sub-surface longlining. While the catch rates of these vessels have been comparable to those mentioned above, there is a lack of any information about the effect of different gear configurations on their performance. Such information is required to maximise efficiency, minimise by-catch and facilitate regulation of effort.

One of the most important factors influencing the performance of longlines is the type and size of the bait used. Because baits represent a significant component of overall costs for small-scale operations, knowledge about the relative performance of different types, including attraction capabilities and ability to remain on hooks, is required to maximise return per hook set.

To address this lack of information, the authors conducted two experiments examining the relative performances of two of the most commonly available baits: mackerel, *Scomber japonicus*, and squid, *Illex argentinus*. Although squid is more expensive, it is generally preferred by established operators, since it is thought to result in higher catch rates and has better durability on the hook. The authors aimed to quantify this anecdotal information and determine if the performance of the cheaper mackerel could be improved via a different orientation on the hook.

The experiments were conducted using two recently converted, small artisanal longliners (eight and twelve metres in length). Both vessels were rigged with the same configurations of sub-surface longliners, consisting of a polyamide monofilament mainline (10 kilometres in length) and 180 hooks set in clusters of six (Lightsticks were attached to alternate secondary lines (according to normal commercial operations). The longlines were set parallel to the coast (in a straight line) between 18.00 and 19.00 each day and left to fish overnight.

In the first experiment, both types of bait were vertically orientated on hooks, according to the methods used by established Brazilian vessels. Squid were hooked through the posterior body, while similar-sized mackerel were secured by passing the hook through the eye. In experiment 2, mackerel were horizontally orientated by passing the hook through the flesh behind and lateral to the dorsal fin, under the backbone and then forwards though the anterior section of the body, while squid were attached similar to the methods used in experiment 1. In each experiment, every second cluster of hooks was alternatively baited with either bait type being tested. A total of 13 and 16 replicate nightly sets of the longline were completed in each experiment, respectively (approximately 50 kilometres from the coast and in areas with depths ranging from 600 to 1,000 metres).

The results from experiment 1 showed that compared to hooks baited with vertically oriented squid, those baited with vertically orientated mackerel had significantly more contact by fish and less bait remaining at the end of each set, but retained significantly less total fish by weight and fewer swordfish. Significantly, more swordfish swallowed

hooks baited with vertically orientated squid than those with vertically orientated mackerel and more died during the hooking process. These results confirm anecdotal reports by fishers that mackerel baits attached through the eye and vertically orientated are generally less effective than squid at retaining fish. However, there was some indication of the potential attraction qualities of mackerel, since large proportions of these baits were missing at the end of each set.

This observation was confirmed in the second experiment, where the relative performance of mackerel was substantially improved when the baits were horizontally positioned. For example, there were no significant differences detected between mackerel and squid baits for the numbers and weights of total fish or swordfish. Orientating mackerel in a horizontal position appeared to increase fish attraction, limit bait theft and improve ingestion of hooks.

The improved performance of mackerel baits in a horizontal position may have been because this orientation more closely resembled swimming fish and/or increased illumination (due to a greater surface area reflecting light), making the baits more visible against the background. Also, it is possible that by securely locating the hook in the flesh of horizontally orientated mackerel, target fish were less likely to detect the hook during initial contact, thereby facilitating ingestion of the bait.

Although these results are preliminary, they have important implications for artisanal longliners. It is apparent that catches of target species can be maintained using the cheaper mackerel, provided baits are secured horizontally. This method also appears to increase ingestion of baits (thereby increasing retention probability) and so fishers may be able to maintain catches using cheap locally-made hooks, rather than the expensive imported designs currently being used.

The results also indicate that visual stimulus is an important factor influencing efficiency of sub-surface longliners. It may be feasible, therefore to examine the utility of simple methods for enhancing bait appearance. This might include artificial baits used in conjunction with small portions of natural baits. The successful development of cheap baits would reduce many of the costs of artisanal longliners and promote their involvement in this fishery.

Further research is still required to assess the abundance, distribution, and migratory patterns of the main target species across the operational range of small artisanal vessels (to determine levels of acceptable effort). If adequate stocks are available, then the inclusion of atleast some small artisanal vessels in this fishery could help address some of the financial problems faced by fishing communities along the north-east coast of Brazil. Equally importantly, a transfer of vessels away from inshore fisheries would alleviate fishing effort on stocks of coastal species.

Source: Vol 13 No.1 (April 2001), *Fishing Boat World*

7th INFOFISH World Tuna Trade Conference

30 May - 1 June 2002, Kuala Lumpur

Tuna 2002, the seventh in the series of **INFOFISH** World Tuna Trade Conferences, will be held for the first time in Kuala Lumpur, the capital city of Malaysia, from 30 May - 1 June 2002. Strategically located in the middle of the Asian "Tuna triangle" of Indonesia, the Philippines and Thailand, Kuala Lumpur is considered an ideal location for a global event of this nature. Apart from being an ideal tourist destination, Malaysia is also in the process of developing its Tuna industry.

An exhibition will also be held in conjunction with **Tuna 2002,** to provide an opportunity for companies and organisations to exhibit and promote their tuna products and processes, tuna fishing and processing equipment and related technology, as well as their services.

Tuna 2002 is jointly organised by **INFOFISH**, together with Food and Agriculture Organization (FAO) - GLOBEFISH, IOTC (Indian Ocean Tuna Commission), IATTC (Inter-American Tropical Tuna Commission), Ministry of Agriculture - Malaysia, TFPA (Thai Food Processors Association) and WTPO (World Tuna Purse Seine Organisation), in collaboration with Department of Fisheries, Malaysia and Fisheries Development Authority of Malaysia (LKIM). The event is supported by Atuna.com.

Since 1986, **INFOFISH** has held a series of Tuna Conferences, which have always attracted a large gathering of delegates from the global tuna industry. Around 450-500 delegates comprising major players and key decision-makers in the tuna industry from nearly 50 countries have attended each of the previous conferences.

Tuna 2002 Kaula Lumpur would provide the global industry yet another opportunity to:

- obtain first hand information on the latest developments, as well as the future prospects of the global tuna industry from well-known industry experts;
- **a)** share views and discuss current problems on various aspects of the industry; **b)** establish new business links and renew contracts; **c)** promote products and services through the exhibition; **d)** witness and get a feel of the growing tuna market in the region; **e)** enjoy, last but not least, Malaysian hospitality in its unique mix of "truly Asian" cultures and the scenic beauty and golden beaches of Malaysia.

The three-day conference will cover topics on global overview of the tuna industry, regional industry situation, markets and marketing, as well as technology, quality and trade issues. A special half-day session will be dedicated for delegates to have business meetings, to attend company presentations and visit the exhibition.

For more information visit web-site at : www.infofish.org or contact **INFOFISH, 1st floor Wisma PKNS Jalan Raja Laut, 50350 Kuala Lumpur, Malaysia. Tel: (603) 2691 4466, Fax: (603) 2691 6804, Email: infish@po. jaring.my, infish@tm. net. my.**

Rajasthan Newsletter

From V.S. Durve

Workshop on "Fish Production using Brackishwater in Arid Ecosystem" at Udaipur

Second Interaction Workshop on the project "Fish production using brackishwater in arid ecosystem" was organized by the C.I.F.E., Mumbai, at Hotel Lakend in Udaipur on 9 January 2002. The objective of the Workshop was to review the progress under the project on the subject and interact with the project scientists and invited experts. The Workshop was presided over by Dr. S. Ayyappan, Director C.I.F.E. Mumbai. Mr.N.P.S.Rathi, Director of Fisheries, Govt. of Rajasthan was the Chief Guest. Dr. D.C.Joshi, Project Co-ordinator of National Agricultural Technology Project (under which the above aquaculture activity comes) and Prof. V.S.Durve, Ex.Professor of Limnology and Fisheries, Rajasthan Agricultural University, presently working in Bhupal Nobles' P.G. College Udaipur, were the invited speakers. Fish farmers, academicians and Fisheries Departmental officers were the main participants.

Dr. Atul Kumar Jain, Scientist (SS) C.I.F.E. and Co-Principal Investigator of the project welcomed the participants. This was followed by a brief account of the objectives of the National Agricultural Technology Project given by Dr. D.C.Joshi of Central Arid Zone Research Institute (CAZRI), Jodhpur. Dr.A.R.T. Arasu, Principal Investigator of the present Brackishwater Aquaculture Project and the Principal Scientist from CIBA Chennai, presented a brief account of the objectives and importance of the project. Mr.N.P.S.Rathi, Director of Fisheries, Rajasthan in his address gave a detailed account of the existing fisheries resources of Rajasthan and the present status of fish production therein. Referring to the rich but utilised saline water areas of the State, Rathi predicted a bright future for brackishwater aquaculture in the State. He highlighted the importance of the ongoing experiments on the culture of *Macrobrachium rosenbergii* and *Mugil cephalus* presently under way at Bharatpur, as the precursors of a second wave of culture fishery development in the State.

Dr. Ayyappan, Director, C.I.F.E., in his presidential address gave a detailed account of the Indian fisheries with special reference to coastal and brackishwater aquaculture. He expressed concern over the neglect of salt affected lands and saline water resources of the country despite their possible use for brackishwater aquaculture. He reiterated the commitment of C.I.F.E. to effectively tackle this problem and bring these presently unutilized water and land resources under aquaculture.

The technical session was held all through the day. Prof. V.S.Durve was the Chairman of the session, assisted by Dr. S.Raizada of C.I.F.E. and Dr.V.P.Saini of the Maharana Pratap Agriculture University. Prof. Durve, in his opening remarks, said that the potential salt affected land and water logged areas available in different districts of Rajasthan was 3,81,620 ha. He revealed that Indira Gandhi Canal Project area alone covered 9,850 sq.km of water logged area with varying degress of salinity and EC values ranging from 2 to > 8 ds/m. With a high reserve of saline ground water yielding up to 200 cu.m/day to bore-wells, Rajasthan offers extensive opportunities for the adoption of brackishwater aquaculture. Durve, while enumerating the presently available candidate species for brackish water aquaculture, stressed the need for strengthened and augmented research inputs to identify new cultivable finfish and shellfish species. The prospects of *Artemia* culture were also emphasized. He told that the environmental vagaries of Rajasthan need to be manipulated in a manner that they would lead to successful brackishwater aquaculture. Durve suggested of over wintering facilities to combat fluctuations in environmental factors. Concluding, he suggested establishment of a regional station of CIBA in arid Rajasthan and a fisheries college to cater to the technical manpower requirements of the aquaculture sector.

There were eight presentations from the CIBA research workers and the staff of the State Fisheries Department. The presentations touched different aspects of the brackishwater aquaculture ranging from the available area in different districts to their physico-chemical conditions and the culture and transportation problems of seed from deep south to the arid region of Rajasthan. The most notable contributions were from Dr.A.R.T.Arasu, Principal Scientist from C.I.B.A., Dr.Atul Kumar Jain of C.I.F.E., Dr. K.L.Jetani from Gujarat Agricultural University and Dr.M.Kailasam of CIBA. Mr. P.K.Ojha from the State Fisheries Department narrated his experiences in successful *Artemia* culture of Sanfrancisco strain in the Sikar district where both saline and freshwater were available side by side. He specifically spoke on the ability of *Artemia* to over winter by itself by staying at the bottom of deep trenches and resurfacing at the return of higher temperatures. He suggested experiments with the local strains of *Artemia*.

Mr. M.A. Quadri of the State Fisheries Department gave a vivid account of the ongoing experiments on aquaculture in Bharatpur where *Macrobrachium rosenbergii* and *Mugil cephalus* in low saline waters.

The technical session was lively, vibrant and informative. Several points were raised by the participants which provoked discussions. For some time the discussion centered around the possible introduction of *Lates calcarifer* in lake Jaisamand to control the *Tilapia* menace and the thermal shock which the seed under transportation to Rajasthan become subject to.

As the session was drawing to a close, Dr.S.Ayyppan, spelled out the following strategical steps to promote brackishwater aquaculture in Rajasthan.

1) Analyse samples of the brackishwater resources of Rajasthan, district and Tehsil wise; 2) Prioritise the candidate species to be experimented with.; 3) Artemia culture should be promoted in Rajasthan as a separate project by importing California strain; 4) Prioritise the work on the project resources, candidate species, experimental objects and cultivation of the accepted species; and 5) Collaborative project on Tilapia and Artemia could be planned.

Dr. D.C.Joshi, Principal Production System Scientist of NATP at CAZRI, Jodhpur, assured that he would guide the project activities as per the suggestions received in the workshop.

Vote of thanks was proposed by Dr. Atul Kumar Jain, Scientist in charge of the newly established C.I.F.E. laboratory at Udaipur.

Workshop on "Sustainable Development for Green Employment"
Udaipur: 15-18 February, 2002

Commonwealth Youth Programme , Asia Centre, Chandigarh, Government of India, Ministry of Youth Affairs, organised a four day seminar on "Sustainable Development for Green Employment", at Maharana Pratap University of Agriculture and Technology from 15-18 Feburary, 2002. Around 50 representatives, primarily social workers active with youth organisations of India, Malaysia, Bangladesh, Srilanka and Nepal participated in the Workshop, besides the local workers. Fish culture was in an important focus at the Workshop. The discussions covered the employment generation prospects for youth in the field of fish culture too, besides agriculture and allied enterprises. Presentations were made by Dr.L.L. Sharma of Department of Limnology and Fisheries, Maharana Pratap University of Agriculture and Technology, Udaipur, and by Dr. V.S. Durve, Ex. Prof. of the same department and presently working in Bhupal Nobles, P.G. College, Udaipur. Dr. Sharma primarily dealt with environmental aspects of pisciculture highlighting its importance as an environmental activity. Prof. Durve spoke on the "Ximbu" system of China which was an excellent age-old example of an integrated aquaculture system. He spoke extensively on the present day integrated farming involving cattle, horticulture, ducks, pigs and poultry besides the beneficial aquatic food plants such as *Trapa* and *Makhana*. He also spoke on the aquaculture opportunities in inland freshwater and brackishwater tanks and ponds in Rajasthan and also about the fish seed production and grow out systems to produce table size fish. He had also explained the emerging opportunities in aquarium fish business in the State. He availed of the occasion to point out that adoption of the term "Aquaculture" in the place of fish culture or pisciculture, as it would be more expressive for the reason that several aquatic species, both plant and animal, were being cultured and not fish alone.

Several questions put by the participants were answered by both the speakers. The participants had doubts about the possibility and feasibility of adopting aquaculture as a gainful self-employment, which were clarified. The highlight of the Workshop was that around 15 of the participants came forward to undertake aquaculture on reaching their home countries. On the fouth day of the Workshop an excursion was arranged to lake Jaisamand where a final farewell dinner of fish was served at the hotel "Jaisamand Island Resort".

Workshop on Seafood HACCP at Visakhapatnam

The Marine Products Export Development Authority organised a four day Workshop on Seafood HACCP at Hotel Green Park, Visakhapatnam from 12-15 February 2002. Altogether 27 candidates representing Seafood processing plants of Andhra Pradesh participated in the workshop. The programme was inaugurated by Mr.Y.Surya Rao, President, Seafood Exporters Association of India, A.P. region. Mr. T.Raghunath Reddy, President, Association of Indian Fisheries Industries, Dr.S. Gupta, Principal Scientist, Central Institute of Fisheries Technology, Visakhapatnam, Mr. J.V.H. Dixitulu, Editor, *Fishing Chimes* and Dr. K.R.Prasad, President, Confederation of Aquaculture Welfare Associations offered felicitations.

The programme covered the following topics: 1) Preliminary steps and prerequisites of the programme; 2) Current good manufacturing practices and sanitation standards, operating procedures; 3) HACCP, Principles;4)US Seafood Regulations; and 5) EU Directives of HACCP. There was a work session to develop HACCP Plan and presentations by participants, and a visit to the processing plant of M/s.Jasper Aqua Exports Ltd., Visakhapatnam was organised.

The Faculty Members who conducted the training programme were Messers. V.I.George, S.S.Shaji, and D.D. Satheesan, Technical Officers and Mrs.A.Parameswaran, Assistant Director, MPEDA. So far MPEDA has trained more than 800 quality control personnel of seafood processing units in HACCP.

ITC to set up Aqua Care Centres in A.P.

It is reported that Aqua Care Centres will be set up by ITC's International Business Division along A.P. coast. The first one would be opened up soon in Kakinada and three more would follow in East Godavari, Prakasam and Nellore districts, it is stated. It is learnt that each of the centres would cost about Rs.35 lakhs in terms of equipment and infrastructure. The Kakinada centre would be equipped for photo documentation of the PCR Screening, it is understood.

The Aqua Care Centres would undertake PCR Screening for detecting WSSV. The samples received from farmers will be coded and results of analysis would be supplied in the code name. ITC believes that the setting up of Aqua Care Centres along the coast, at points convenient for farmers to bring samples for analysis would ensure utilisation of disease-free shrimp seed for stocking growout ponds.

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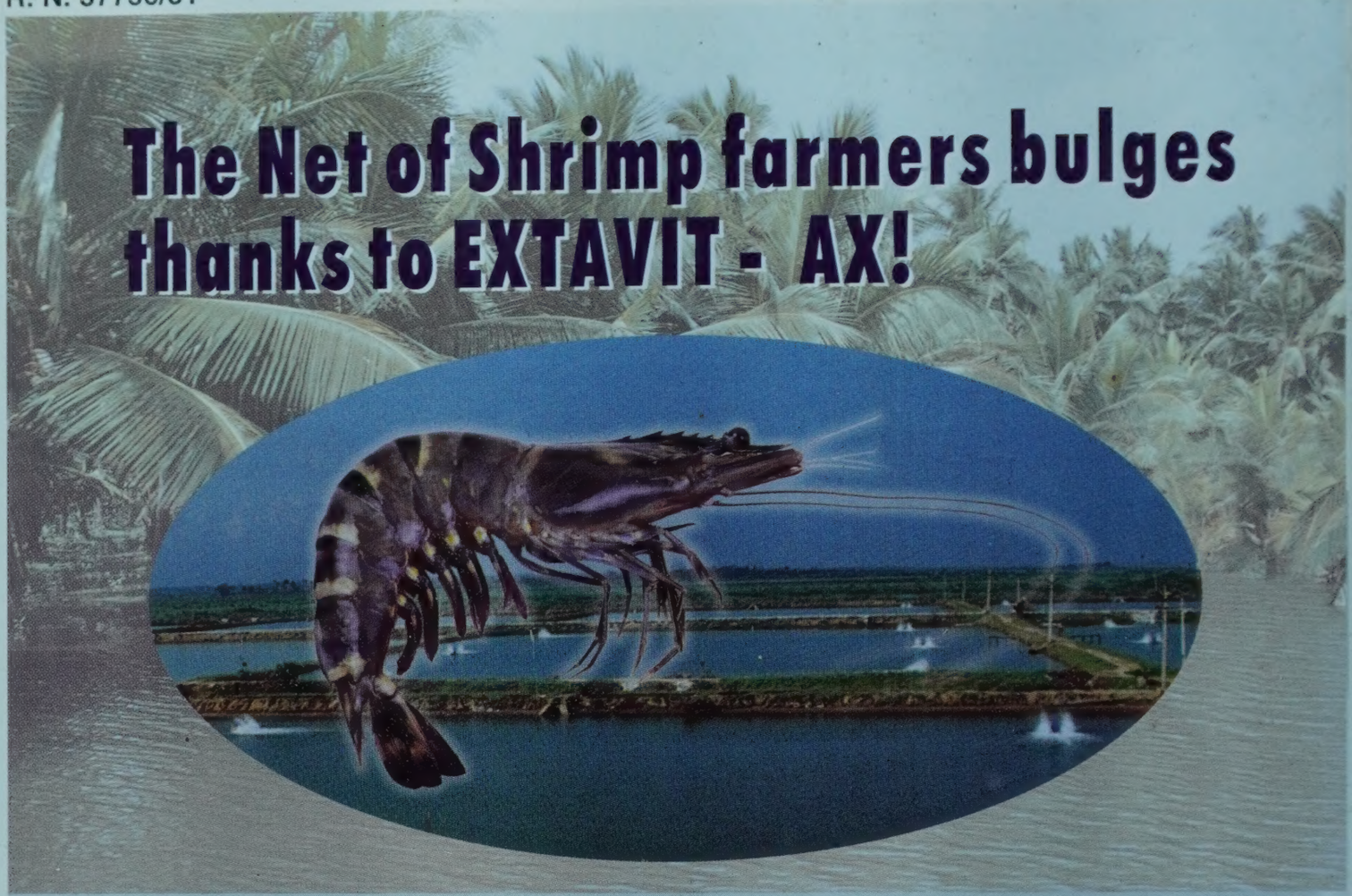

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